AGROFUELS AND FAMILY AND PEASANT AGRICULTURE

INPUTS FOR THE DEBATE

PREPARED BY:

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Federação de Órgãos para
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AGROFUELS AND FAMILY AND PEASANT AGRICULTURE - INPUTS FOR THE DEBATE
Report from the seminar held in Rio de Janeiro on July 12-13, 2007

Editorial project, graphic design, revision and artwork:
Usha Velasco (ushavelasco@gmail.com)

Coordinated by :
Kátia Maia (Oxfam International)
Nathalie Beghin (Oxfam International)

Photography:
Fabrício Martins, Felipe Ferreira, Sérgio Vignes and Ubirajara Machado

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FASE / REBRIP
Rua das Palmeiras, 90 - Botafogo
ZIP Code: 22270-070 Rio de Janeiro RJ - Brazil
Tel.: (55) (21) 2536-7350 Fax: (55) (21) 2536-7379
fase@fase.org.br

Oxfam International Office in Brasilia
SCS Quadra 8 Bloco B 50 Sala 401 Edifício Venâncio 2000
ZIP Code: 70333-970 Brasília DF - Brazil
Tel.: (55) (61) 3321-4044 Fax: (55) (61) 3323-8552
brasília@oxfam.org.br

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Summary


Ubirajara Machado


Felipe Ferreira


Ubirajara Machado


Fabrício Martins


Sérgio Vignes


Sérgio Vignes

INTRODUCTION

Ubirajara Machado

This book is the outcome of a seminar held in Rio de Janeiro on July 12-13, 2007 at the initiative of the Working Group on Agriculture of Rede Brasileira pela Integração dos Povos – REBRIP (*Brazilian Network for the Integration of the Peoples*)) and Federação de Órgãos para Assistência Social e Educacional – FASE (*Federation of Agencies for Social and Educational Assistance)*, with the support from ActionAid Brazil, the Heinrich Boll Foundation and Oxfam International. This meeting had multiple objectives, among which the following ones stood out: discussing the "state of the art" of the agrofuel topic in Brazil; exchanging information among the participants; contributing to shape critical opinions and define the strategies and plans of civil society organizations and social movements dealing with the topic; sharing knowledge among the members of the Working Group on Agriculture; and identifying elements for building a strategy for actions to be taken by the Working Group and its allies.

The seminar was attended by approximately seventy participants from social movements, academic institutions, civil society organizations, networks, and forums, governmental agencies and corporate entities. The meeting was divided into six sessions: in the first one, the opening session, the context of the development model that led to the agrofuel "rush" was described. In the second session, two studies especially prepared for the event by researchers from the Universidade de São Paulo – USP (*University of São Paulo*) and of the Universidade Federal Rural do Rio de Janeiro – UFRRJ (*Federal Rural University of Rio de Janeiro*) were presented, which provided detailed information on the two main agendas of fuels from biomass in Brazil: the ethanol and the biodiesel agendas. In the third session, representatives of governmental institutions presented their diagnoses, action strategies and challenges. In the two following stages, social movements and networks of civil society organizations presented their perspectives and described their struggle and challenges. Finally, after a debate session, a summary of the event was presented, indicating consensuses and also issues that need to be further discussed in the near future.

Given the wealth of information, suggestions and proposals provided in the presentations and discussions held during the seminar, the sponsoring and supporting organizations decided to publish this book with the aim of sharing and disseminating what was discussed during the two days of the seminar. This publication is divided into four chapters. The first one, by Jean Pierre Leroy, from FASE, is the opening presentation, which sought to describe the context and problems related to agrofuels in Brazil. The next chapter, by John Wilkinson and Selena Herrera (CPDA-UFRRJ), describes ethanol- and biodiesel-related issues, placing the analysis within a global context. It also addresses the impact of agrofuels on agricultural production and, particularly, on family and peasant agriculture. The third chapter presents the results of a comprehensive research project coordinated by Célio Bermann, from USP, which analyzes the sugarcane, soybean, castor bean and palm oil chains.

Finally, the fourth chapter documents the main issues addressed during the seminar. This documentation is divided into two parts. The first one addresses the agrofuel topic from the perspective of the representatives of federal government institutions and the private sector who attended the seminar. The second part compiles three sets of information: (i) presentations made by representatives of social movements, i.e. of the Federação dos Trabalhadores da Agricultura Familiar – FETRAF (*Federation of Workers in Family Agriculture)* of the Confederação Nacional dos Trabalhadores na Agricultura Familiar – CONTAG (*National Confederation of Agricultural Workers*) and of the Movimento dos Trabalhadores Rurais Sem Terra – MST/Via Campesina (*Landless Movement)*; (ii) presentations made by representatives of networks and articulations, such as the Fórum Brasileiro de Segurança Alimentar e Nutricional – FBSAN (*Brazilian Food and Nutrition Security Forum*), the Articulação Nacional de Agroecologia – ANA *(National Agroecology Articulation)* and the Fórum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e o Desenvolvimento – FBOMS (*Brazilian Forum of NGOs and Social Movements for Environment and Development*); and (iii) the results of the debates held during the two days of the seminar[1].

It should be highlighted that the word selected by FASE and REBRIP 's Working Group on Agriculture to define fuels produced from biomass was "agrofuels" and not "biofuels." The purpose of this deliberate option was to make it clear that the practices being adopted for producing ethanol and diesel from agricultural products in Brazil and in the world are not consistent with the word *bio*, which means life in Greek. The term "biofuels" evokes an image of renewal and abundance – a clean, green and sustainable guarantee for the development of all, including developing countries. This image allows various sectors to present fuels from sugarcane, corn, wheat, soybeans, castor bean, palm oil and other plants as a safe step to a "successful transition" from a petroleum-based economy to a renewable economy yet to be defined. Therefore, the term "biofuel" draws our attention away from powerful economic interests that will benefit from this transition; it avoids discussions on harmful impacts on the environment, sovereignty and food and nutrition security; and it darkens the debate on the urgent need to adopt another development model which can actually foster equality among human beings and their harmonious coexistence with the planet. Therefore, in order not to jeopardize the meaning of the word "life" and to clearly define what is actually being addressed, we decided to use the word "agrofuels" in this publication.

We hope that this book will contribute toward expanding the debate on agrofuel production in Brazil by providing information, opinions and analyses to be used as benchmarks by leaders of social movements and civil society organizations and the general public interested in discussing the topic of renewable energy and its impacts on family and peasant agriculture.

We hope you will enjoy reading it!
The organizers

[1] The list of organizations that attended the meeting can be found in the annex.

List of acronyms

AA	ActionAid
ABIOVE	Associação Brasileira das Indústrias de Óleos Vegetais *(Brazilian Association of Vegetable Oil Industries)*
ABRANDH	Ação Brasileira pela Nutrição e Direito Humano *(Brazilian Action for Nutrition and Human Rights)*
ANA	Articulação Nacional de Agroecologia *(National Agroecology Articulation)*
ANFAVEA	Associação Nacional dos Fabricantes de Veículos Automotores *(National Association of Vehicle Manufacturers)*
ANP	Agência Nacional de Petróleo, Gás Natural e Biocombustíveis *(Agency of National Petroleum, Natural Gas and Biofuels)*
BASA	Banco da Amazônia (*Bank of Amazon*)
BED	Brasil Ecodiesel
BEN	Balanço Energético Nacional *(National Energy Balance)*
BNB	Banco do Nordeste do Brasil (*Bank of Northeast of Brazil*)
BNDES	Banco Nacional de Desenvolvimento Econômico e Social *(National Economic and Social Development Bank)*
BOD	Biochemical Oxygen Demand
CAA	Centro de Agricultura Alternativa do Norte de Minas Gerais *(Alternative Agriculture Center of the North Region of Minas Gerais)*
CDL	Clean Development Mechanisms
CEPEA/USP	Centro de Estudos Avançados em Economica Aplicada da Universidade de São Paulo *(Center for Advanced Studies on Applied Economics of the University of São Paulo)*
CEPEPO	Centro de Estudos e Práticas de Educação Popular *(Center for Popular Education Studies and Practices)*
CGE	Comitê Gestor Estadual *(State Managing Committee)*
CIDE	Contribuição de Intervenção no Domínio Econômico *(Contribution for Intervention in the Economic Domain)*
CIMA	Conselho Interministerial de Açúcar e Álcool (*Interministerial Sugar and Ethanol Council*)
CIPATR	Comissão Interna de Prevenção de Acidentes no Trabalho Rural (*Internal Commission for the Prevention of Rural Occupational Accidents*)
CNA	Confederação da Agricultura e Pecuária do Brasil (*Agriculture and Livestock Confederation of Brazil*)
CNAA	Companhia Nacional de Açúcar e Álcool (*National Sugar and Ethanol Company*)
CNPE	Conselho Nacional de Política Energética (*National Energy Policy Council)*
COD	Chemical Oxygen Demand
COFINS	Contribuição para o Financiamento da Seguridade Social (*Contribution to Social Security Financing)*

CONAB	Companhia Nacional de Abastecimento *(National Supply Company*)
CONTAG	Confederação Nacional dos Trabalhadores na Agricultura Familiar (*National Confederation of Agricultural Workers*)
COOPERBIO	Cooperativa Mista de Produção, Industrialização e Comercialização de Biocombustíveis do Brasil (*Biofuel Production, Industrialization and Trade Cooperative of Brazil*)
CPDA/UFRRJ	Programa de Pós-Graduação de Ciências Sociais em Desenvolvimento, Agricultura e Sociedade da Universidade Federal Rural do Rio de Janeiro (*Post Graduate Program in Social Sciences in Development, Agriculture and Society of the Federal Rural University of Rio de Janeiro*)
CPT	Comissão Pastoral da Terra (*Land Pastoral Commission)*
CTC	Centro de Tecnologia Canavieira (*Sugarcane Technology Cente*r)
CTNBio	Comissão Técnica Nacional de Biosegurança *(National Technical Commission on Biosafety)*
CUT	Central Única dos Trabalhadores (*trade unions*)
CVM	Comissão de Valores Mobiliários (*Securities and Exchange Commission*)
DESER	Departamento de Estudos Socioeconômicos Rurais (*Rural Socioeconomic Studies Department*)
DIEESE	Departamento Intersindical de Estatística e Estudos Socioeconômicos (*Inter-union Statistics and Socioeconomic Studies Department*)
ECLAC	Economic Commission for Latin America and the Caribbean
EMATER	Empresa Estadual de Assistência Técnica e Extensão Rural (*Technical Assistance and Rural Extension Company*)
EMBRAER	Empresa Brasileira de Aeronáutica S.A.
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária (*Brazilian Agriculture/Livestock Research Company)*
EPE	Empresa de Pesquisa Energética (*Energy Research Corporation*)
EU	European Union
FAFOP	Federação das Associações dos Assentados e Agricultores Familiares do Oeste Paulista (*Federation of Associations of Settled Populations and Family Farmers of the West Region of the State of São Paulo)*
FAO	United Nations Food and Agriculture Organization
FASE	Federação de Órgãos para Assistência Social e Educacional (*Federation of Agencies for Social and Educational Assistance)*
FBOMS	Fórum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e o Desenvolvimento (*Brazilian Forum of NGOs and Social Movements for Environment and Development*)
FBSAN	Fórum Brasileiro de Segurança Alimentar e Nutricional (*Brazilian Food and Nutrition Security Forum*)

FETAESC	Federação dos Trabalhadores na Agricultura do Estado de Santa Catarina (*Federation of Agriculture Workers of the State of Santa Catarina*)
FETAG	Federação Estadual dos Trabalhadores na Agricultura (*State Federation of Agriculture Workers*)
FETRAF	Federação dos Trabalhadores da Agricultura Familiar (*Federation of Workers in Family Agriculture)*
FINEP	Financiadora de Estudos e Projetos (*Studies and Projects Financing Agency*)
FOB	Free on Board
FORMAD	Fórum Matogrossense de Meio Ambiente e Desenvolvimento (*Environment and Development Forum of the State of Mato Grosso*)
GET	Global Energy and Telecommunication
HDI	Human Development Index
HRAF	Human Right to Adequate Food
HSA	Hemispheric Social Alliance
IBASE	Instituto Brasileiro de Análises Sociais e Econômicas (*Brazilian Institute for Social and Economic Analyses*)
IBGE	Instituto Brasileiro de Geografia e Estatística *(Brazilian Institute for Geography and Statistics)*
ICMS	Imposto sobre Circulação de Mercadorias e Prestação de Serviços (*Tax on Circulation of Goods and Services*)
ICONE	Instituto de Estudos do Comércio e Negociações Internacionais (*Institute for International Trade Negotiations*)
IDB	Inter-American Development Bank
IEC	Interamerican Ethanol Commission
IMF	International Monetary Fund
INESC	Instituto de Estudos Socioeconômicos (*Institute for Socioeconomic Studies*)
IPEA	Instituto de Pesquisa Econômica Aplicada (*Institute for Applied Economic Research*)
IPS	Inter Press Service
ISA	Instituto Sócioambiental (*Socioenvironmental Institute*)
LOSAN	Lei Orgânica de Segurança Alimentar e Nutricional (*Organic Food and Nutrition Security Law*)
MAB	Movimento de Atingidos por Barragens (*Movement of People Affected by Dams*)
MAPA	Ministério da Agricultura, Pecuária e Abastecimento (*Ministry of Agriculture, Livestock and Supply*)
MCT	Ministério de Ciência e Tecnologia (*Ministry of Science and Technology*)
MDA	Ministério do Desenvolvimento Agrário (*Ministry of Agrarian Development)*
MDIC	Ministério do Desenvolvimento, Indústria e Comércio Exterior (*Ministry of Development, Industry and Foreign Trade*)
MERCOSUR	South Common Market
MMA	Ministério do Meio Ambiente (*Ministry of Environment*)
MME	Ministério das Minas e Energia (*Ministry of Energy and Mining*)
MPA	Movimento dos Pequenos Agricultores (*Small Farmers Movement*)
MST	Movimento dos Trabalhadores Rurais Sem Terra (*Landless Movement)*
MTE	Ministério do Trabalho e Emprego (*Ministry of Labor and Employment*)

NGO	Non-governmental Organization
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of Petroleum Exporting Countries
ORIT	Organização Regional Interamericana de Trabalhadores (*Interamerican Regional Workers' Organization*)
PASEP	Programa de Formação do Patrimônio do Servidor (*Asset Formation Program for Civil Servants*)
PETROBRAS	Petróleo Brasileiro S.A.
PIS	Programa de Integração Social (*Social Integration Program*)
PNAD	Pesquisa Nacional por Amostra de Domicílios (*National Household Sample Surveys*)
PNPB	Programa Nacional de Produção e Uso do Biodiesel (*National Biodiesel Production and Use Program*)
PROÁLCOOL	Programa Nacional do Álcool *(National Alcohol Program)*
PRONAF	Programa Nacional de Fortalecimento da Agricultura Familiar (*National Program for Strengthening Family Agriculture*)
RAIS	Relação Anual de Informações Anuais (*Annual Social Information List*)
REBRIP	Rede Brasileira pela Integração dos Povos (*Brazilian Network for the Integration of the Peoples*)
REDE BRASIL	Rede Brasil sobre Instituições Financeiras Multilaterais (*Brazil Network on Multilateral Financial Institutions*)
SAF	Secretaria de Agricultura Familiar do Ministério do Desenvolvimento Agrário (*Family Agriculture Secretariat of the Ministry of Agrarian Development*)
SEBRAE	Serviço de Apoio às Micro e Pequenas Empresas (*Brazilian Service in Support of Micro and Small Companies*)
SINDAG	Sindicato Nacional da Indústria para Defesa do Agronegócio (*National Union of the Industry in Defense of Brazilian Agribusiness*)
SUFRAMA	Superintendência da Zona Franca de Manaus (*Manaus Free Zone Superintendence*)
TRS	Total Recoverable Sugar
UBRABIO	União Brasileira do Biodiesel (*Brazilian Biodiesel Union*)
UFRRJ	Universidade Federal Rural do Rio de Janeiro (*Federal Rural University of Rio de Janeiro*)
UFSc	Universidade Federal de Santa Catarina (*Federal University of Santa Catarina*)
UN	United Nations
UnB	Universidade de Brasília (*University of Brasília*)
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNICA	União da Agroindústria Canavieira de São Paulo (*Sugarcane Agroindustry Union of São Paulo)*
UNICAMP	Universidade Estadual de Campinas (*State University of Campinas)*
US	United States
USP	Universidade de São Paulo (*University of São Paulo*)
WTO	World Trade Organization
WWF	Worldwide Fund for Nature

Felipe Ferreira

CHAPTER I

Context and problems related to agrofuels in Brazil

Jean Pierre Leroy

- A brief background of a word and a dream: development
- Sustainability: what? whose? what for?
- Brazilian "rural development"
- The new wave: agrofuels

The term "biofuels" is used in current language, but the seminar refers to them as "agrofuels." Is this just a vocabulary issue? No. When it was decided that the word "agrofuels" would be used at the World Social Forum on Food Sovereignty held early in 2007 in Mali, this decision clearly marked a gap and even an incompatibility between two realities. One of them associates this type of energy to sustainability and life; the other one, precisely because it challenges this vision, prefers to use the word "life" (*bio* in Greek) to refer to realities which are actually committed to life. The practices adopted by leading companies in biotechnology and CNTBio reinforce our positions. Once again, there is a dispute around what development is all about behind these words.

Brief background of a word and a dream: development

Let us begin by addressing the origins of the Industrial Revolution. Eric Hobsbawm points out three fundamental changes in that era, which according to him is the 1789-1848 period: the beginning of the demographic explosion; development of communications (not only of roads and then railroads, but also of speed and load capacity); and, finally, international trade and emigration[1]. Supported by the use of mineral coal and steam machines, industrial capitalism began its triumphal path to the so-called "glorious decades," the 1950s, 1960s and 1970s of the 20th century, the "golden age" also described by Hobsbawm.

In those "golden years," which began after the end of the Second World War, the western world reached prosperity levels that benefited most of its population. There was an energy consumption boom, particularly of petroleum and nuclear energy, involving popular masses in Europe. Petroleum became synonym with power, not for producing countries, but for large corporations. Hiroshima heralded nuclear energy, which was dubbed the "energy of the future." The urban world prevailed over the rural world once and for all in industrialized countries in that period. But the historian deals with this era as a worldwide phenomenon, because "the population of the Third World has increased spectacularly" and, during a certain period, "endemic hunger disappeared."[2] This, however, didn't ensure prosperity. On the contrary, while incommensurable distance was kept in relation to western industrialized countries, the very relative improvement observed in their situation could feed the illusion that their luck was about to change.

It was at that moment, in fact, that the ideology of development was born[3], after the end of World War II and beginning of the Cold War. This ideology consists in: (i) making us believe that the standard of life achieved in the US (and then in western countries and Japan, thanks to the reconstruction of their economies under the Marshall Plan) and the production model that enabled them to achieve it constitutes "development"; (ii) persuading poor colonized, subordinate and dependent countries that they will achieve this development level with the help from those who already achieved it.

The rise of neoliberalism, during a period in which capitalism referred to the fall of communism as evidence of its triumph, relegated development to a secondary status. The all-

[1] HOBSBAWM, Eric J. *A Era das Revoluções 1798* - 1948 (The Age of Revolution). Paz e Terra publishing house, 4th edition, Rio de Janeiro, 1982, pp. 187 - 191.
[2] HOBSBAWM, Eric J. *Era dos Extremos: O breve século* (The Age of Extremes: The Short Twentieth Century) *1914-1991.* Companhia das Letras publishing house, 2nd edition, São Paulo, 1995, pp. 255.
[3] RIST, Gilbert. *Le développement. Histoire d'une croyance occidentale.* Presses de Cience Po, Paris, 1996.

powerful market could show its face without the subterfuge of development. Developmentism would be relegated to some multilateral United Nations (UN) and Bretton Wood bodies (the World Bank). To give a new polish to it, the United Nations Development Program (UNDP) adopted the Human Development Index (HDI). But when the Rio-92 Conference, the United Nations Conference on Environment and Development, was held, the term was resumed with all its magnetism and dubbed "sustainable" development.

Sustainability: what? Whose? What for?

We've become accustomed to using the term sustainable development following, consciously or not, the definition contained in the Brundtland Report: "[Sustainable development] is a development model that meets present needs without jeopardizing the possibility for future generations to meet their own needs." This definition was used as a benchmark at the Rio-92 Conference. Which needs does it meet? Great, we cannot be against this. But what are these needs? Who defines them?

The Agenda 21 answered this question implicitly. In it, sustainable development was left for the market to take care of, as announced in its chapter 2, modestly called "International cooperation to accelerate sustainable development in developing countries and related domestic policies"[4], which therefore defined what these needs are based on certain guiding criteria: poverty reduction and environmental improvements. But "international cooperation" is a global market and "related domestic policies" are measures that countries should take to ensure the liberalization of their markets. We know that the market is profit-oriented, that the market largely determines the desires of consumers, and that it only cares about the environment when consumers demand it. What the Brundtland definition and the Agenda 21 actually do is to invite us to preserve the current production model and consumption patterns with a few exceptions. Obviously, this model is invited to adapt itself, producing new technologies designed to save natural resources and energy, which generate new profit sources for the industry of capital goods in more industrialized countries and for financial capital.

Sustainability is not something that is simply given. Why do the holders of economic and political powers define what is good for us all beforehand? Is it not a fact that their strategies to preserve their power reinforce excluding and inequality-reproducing mechanisms, which are largely based on the pillage of natural resources and of the environment? Industrialized countries are being hypocritical as never before when they propose their development model to the world, since they know that it is impossible to extend these privileges to the whole world, since the model presupposes that part of humankind continues to suffer inequity. Don't we also know that the extremely poor will never be able to have consumer goods that are considered necessary in the light of our current consumption patterns? Don't we know that pursuing this development model presupposes reproducing this same inequality?

You cannot cook an omelet without breaking eggs. We always hear or read that a few members of riverine or indigenous populations should not be able to prevent a hydroelectric power plant that is indispensable to the country's growth from being built and that "alleged

[4] Chamber of Representatives. Committee for Consumer Defense, Environment and Minorities. *Agenda 21*. United Nations Conference on Environment and Development. Brasília, Chamber of Representatives, Publications Board, 1995.

descendants of runaway slaves" and indigenous peoples should not be able to monopolize large tracts of land when the country needs to produce more.

When one realizes that those who created this situation are the ones who claim to be promoting sustainable development, one is led to consider the "sustainable development" concept in greater detail. Capitalism turned it into an oxymoron, combining two words that, together, constitute a contradiction. It is the same old ideology of development, but more sophisticated and refined. Apart from making us believe that it is for all, they now want us to believe that it is forever, provided that certain measures are taken, as Gilbert Rist remarks ironically: "After having turned 'development' into a universal phenomenon (since nobody can escape it from now on), they had to turn it into something eternal[5]."

We see sustainability not as something that is given, but rather as a project to be build, the project of a new society, a project of democracy. While a minority linked and subordinated sustainability to the market and to the ideology that sustains it, other social groups and classes can fight to make sure other values prevail in the consciousness of humankind. We define sustainability as *"the process through which societies manage the material conditions for their reproduction, redefining the ethical and sociopolitical principles based on which their natural resources are distributed*[6]". As a process, sustainability is not something that is preestablished, but rather something that is socially built. One cannot say "we have achieved sustainability" or "if we change this or that, we will achieve it." It is a permanent and active search for better living conditions, *"in constant inter-relation with environmental and planetary conditions,"* as we should add to our definition. This redefinition implies ethical principles of non-domination and coexistence with nature, moderate use of material goods, full prevalence of the use value over the exchange value, the principle of precaution and responsibility, solidarity and equity, awareness of limits, etc.

The Brazilian "rural development"

From brazilwood to drugs used in rural areas to coffee and rubber, Brazil experienced economic booms which shaped its condition of an exploited colony, from which riches were taken to be enjoyed by European powers. Through *foul and fair*, indigenous peoples, descendants of black slaves, degraded populations and settlers, whether from mixed race or not, managed to survive despite the hegemony of large landownership schemes and settled in the "interstices of large landownership," in remote locations that large landowners were not interested in or which had been abandoned after some export production cycle or, more rarely, in the few locations where they were actually settled. I ask myself if we are not close to the end of this fragile and much-challenged and repressed coexistence or if there is still a future for family and peasant agriculture.

During the Conference of the Parties, which ensured the continuity of negotiations on the Biodiversity Convention, the so-called COP 8 (held in Curitiba in 2006), I heard Paul Nicholson, from Via Campesina, denounce the "totalitarian" character of soybean transgenics, which do not tolerate any coexistence because they mix in machines, in storage facilities and when they are transported. The same thing would happen to transgenic corn, through air

[5] RIST, Gilbert. Op. cit., p. 314.

[6] LEROY, Jean Pierre *et al. Tudo ao mesmo tempo agora. Desenvolvimento, sustentabilidade, democracia. O que isso tem a ver com você?* Rio de Janeiro: Voices publishing house/Sustainable and Democratic Brazil Project, 2002, p. 18.

pollination. I then remembered a DVD produced by FASE and CEPEPO, called *O grão que cresceu demais* (the grain that grew too much), which showed how it is impossible for small farmers in the municipality of Santarém, state of Pará, to continue to live and grow their crops after they were isolated in "islands" by soybean crops. Air fumigations ended up destroying their honeycombs and orchards and threaten their health. Little by little, the dwellers left. The local school was closed down and the transportation became very scarce. No coexistence was possible between the two production models.

While in the past there were lands which capital was not interested in because of their distance from ports and markets or for technical reasons, such as poor soil fertility, lack of water or inappropriate weather, the technologies available today make it possible to expand production areas. When soybeans began to be grown in Paragominas, in the state of Pará, the results were not very good. But new varieties adapted to the Amazon region were soon developed. And it's useless to declare moratorium on soybean cultivation in the Amazon region. Its expansion in other regions will increase livestock production and tree plantations. The weight of family farmers, peasants and agroextractivists in this connection is small. Not to mention the depressed price of what they produce: all possible efforts are made to remove or keep them away from productive lands and markets. Logistics, machinery, credit... nothing has been designed for them. Things got to the point where 500-hectare farms are considered small for growing soybeans in the state of Mato Grosso. The productive model of the so-called "green revolution" has been taken to extremes.

If not totalitarian, the ideology of growth brought about by "development" has prevailed. It allows actions of exporting agribusiness on the territory to prevail as an achievement that destroys ecosystems and the way of life of populations that preceded it. Everything can be done in the name of "development" and of generating jobs. The old colonial exporting logic is once again imposed, but this time with an aura of virtuosity. However, when reality proves that such virtues are not there, it will be too late for those who were driven out of their land or who were forced to survive off the crumbs of this model.

With it, the despised large landownership scheme was refreshed and renamed agricultural company. In the name of production, the aberration of lands extending for thousands of hectares is justified. That which is supposedly "modern" continues in these contemporary large landownership schemes side by side with that which is supposedly "archaic." The local, regional and even national policy is used to promote a new version of the old "rule of the colonels" (a classic boss system under Brazil's old republic); multiple incentives and eternal credit renegotiations that could constitute new forms of patrimonialism; land-grabbing or dubious appropriation of public lands; slave labor or labor overexploitation; contempt for nature... How all of this is modern!

It would not be correct to place farmers at the core of the model. Agricultural activities, carried out by either small or large farmers, have lost their centrality. Upstream of the production chain, the paths of agriculture are determined by large corporations that carry out research into, produce and trade agricultural inputs (machines, seeds, pesticides and chemical fertilizers), while downstream of it these paths are defined by transformation agroindustries and by those who sell the resulting products. These industries are rapidly oligopolized and controlled by a few large corporations. They act according to the strict logic of the global market, which is neoliberal. Under their control, no one can interpret "agricultural and rural development" as having any other meaning than the one defined above.

The territory on which the market acts is an abstract territory. It makes no difference whether it is a *cerrado* (savannah) area or a forest, except to evaluate soil and weather conditions; it makes no difference if there are people in this territory, except to ensure a

market and labor or to clean up the land to facilitate business. Capital has to make profits within the shortest time possible; for it, the issue is: here, in this region, we will make money. The product to be exported makes no difference, and neither does the territory, its past or its future. Whether it is located in Brazil or China makes no difference. The land can be useful today, but if doesn't generate profits tomorrow, capital will look for land elsewhere. Therefore, nothing more normal for capital than removing or ignoring people who live in areas without history if they are of no service. It is not unusual in any way that the territory where it arrived moved by the desire to make as much profit as possible and by a persistent colonial mentality into some sort of an "invisible" territory, something to be used for the sole purpose of supporting its activities, regardless of whether it is destroyed and its soil, water and biodiversity are plundered in a true manifestation of "green colonialism."

The new wave: agrofuels

The term - "green colonialism" - was coined with our new and last cycle, the agrofuel cycle. It emerged in a period marked by the end of what could be referred to as the "petroleum civilization." The end of great discoveries of new fossil fuel reserves is being announced and the duration of existing reserves is being assessed; the main consuming nations are facing a situation of huge insecurity in relation to the main producing countries in the Middle East; their preeminence in CO^2 production, the main gas causing the greenhouse effect, challenges its use. There is no doubt that agrofuels are growing in importance at a fast pace because of the unanimous realization of climate change affecting the planet.

Their propagation is perfectly in tune with the developments of the Climate Convention. In the Kyoto Protocol, the signatory governments established the so-called Clean Development Mechanisms (CDMs), according to which polluting countries can make up for their emissions by supporting projects designed to produce clean energy or which are aimed at, for example, reducing the production of greenhouse-effect gases. Under these mechanisms, companies that plant eucalyptus trees under the pretext that they capture a little bit of excess carbon from the atmosphere can apply for resources made available under the CDMs by, for example, a fossil fuel-producing company in the US that wants to reduce its liabilities. It should be noticed, however, that by doing this they preserve their right to keep on polluting. The CDMs foster an increasing carbon market, where enterprises and banks buy and sell credits. Agrofuels can potentially offer positive opportunities for transactions in this market. Some analysts also believe that they would bring new life to the agricultural market, which is quite depressed.

They would also help, therefore, to turn villains into benefactors. We saw that the Rio-92 Conference assigned the task of saving the planet to the market. This position was strengthened in 2002, at the Rio + 10 Conference held in Johannesburg. One could think that only incautious people would fall for this confidence trick. But the approval of the UN and of governments, the support from the media with little criticism, the permanent green publicity campaign promoted by the most interested enterprises, the money they give out quite generously, keeping many people from speaking up, make up for any negative public image that could be attributed to it. From the point of view of individual consumers, agrofuels have the merit of relieving from guilt. One can continue to drive a private car without feeling guilty about it.

They bring other developments, such as risk, speculative investments in this market (which as easily as they are made can be withdrawn, looking for something more profitable) and "foreignization" of the land. All these issues will surely be resumed and discussed in greater detail during this seminar.

While the scenario is gloomy and the correlation of forces is widely unfavorable to our rural areas, one should remember that there is a dispute going on, a dispute between macroeconomics, where the market rotates around itself, and social economics, where the use value prevails and the exchange value is subordinated to it; between the global market and local economies, where production and consumption circuits are drawing closer together. It is a dispute between a totalitarian project of transnational corporations above States and a political and economic democracy project; between a model for increasingly artificializing production (leading to its environmental unsustainability, food insecurity and nutrition deficits) and sustainable family and peasant agriculture projects; between views and constructions of territories. But there will only be a real dispute between agrofuels if our challenging and proposals are based on a perception that is different from the one under dispute, which is our own sense of "development," the future of a more egalitarian society, characterized by a more harmonious coexistence with the planet.

Ubirajara Machado

CHAPTER II

Inputs for the discussion on agrofuels in Brazil[1]

John Wilkinson and Selena Herrera

- Agrofuels in Brazil
- PROÁLCOOL
- The Biodiesel Program
- Main actors and their positionss
- Considerations on some topics under discussion

[1] This paper was written on July/2007.

Introduction

The strong rise observed in petroleum prices, which is expected to continue in the medium term, and pressures for reducing the emission of greenhouse gases are stimulating the adoption and the acceleration of policies and strategies for developing alternative and renewable energy sources, among which agrofuels. In the form of ethanol and biodiesel, these would be an alternative to replace or reduce the use of gasoline and fossil diesel for transportation purposes, which accounts for about 30% of all carbon gas emissions in industrialized countries.

The Council of Europe confirmed, in March 2007, a binding target of having 20% of the EU's overall energy consumption coming from renewables by 2020 and also a compulsory share of 10% of agrofuels in its total gasoline and fossil diesel consumption. In the United States, in a speech delivered in January 2007, Bush set a binding target of US$ 35 billion in renewable and alternative fuels by 2017, five times higher then the previous target, equivalent to 15% of the annual gasoline use.

China, the second largest energy consumer in the world, ranks third in the production of ethanol, which accounts for 20% of the consumption of domestic fuels. Most of this ethanol is made from corn and wheat; food security concerns are already stimulating the use of alternative raw material sources. India also launched its *gasohol* program through a policy according to which ethanol is to be blended with gasoline at a proportion of 5% in nine sugarcane-producing states. The high costs of the program led to its suspension; now, the focus is on producing biodiesel from a drought-resistant tree species. Thailand, which is a major sugar exporter, has plans to replace gasoline by 10% using ethanol as of 2007. Indonesia and Malaysia, in turn, have become major palm oil exporters as a result of the demand from Europe. Africa has also become the target of many large projects both of industrialized countries and of large developing countries - Brazil, China and India.

Brazil, which launched the PROÁLCOOL program in the 1970s, is a pioneer in producing ethanol from sugarcane at the lowest costs in the world. In the 1980s, most of its fleet of automobiles was fueled by ethanol already. Relative changes in prices undermined the program since then, but in the new scenario prevailing today, ethanol both for the domestic and the export market is back with full strength. Today, Brazil faces the prospect of witnessing an unprecedented expansion in ethanol production, also stimulated by a wave of foreign investments. In the case of biodiesel, however, Brazil is still crawling, supported by a policy of incentives adopted by the federal administration. Given the return of ethanol and the incipient expansion of biodiesel, it is a timely moment to reflect on the implications of promoting agrofuels in Brazil, in the context of globalization.

Attention should be drawn to the uncertainty surrounding the topic, both because of the speed of new developments and the incipient character of many policies and the complexity involved in evaluating its consequences. It can be clearly perceived, however, that the trade-offs may challenge the benefits of replacing fossil fuels with renewable fuels, which seem so evident at first glance. NGOs in Europe are calling for a moratorium on the program in the continent and for radical changes in it, after realizing that it can harm the environment in the main agrofuel-exporting countries as a result of expanding palm oil plantations. In the US, civil society organizations have been stressing that the measures that were announced are still timid, while the food industry is worried with their unintentional consequences on food production, considering that corn is the main raw material used for producing agrofuels in the US.

This paper describes the agrofuel scenario in Brazil (both for ethanol and biodiesel), situating the analysis within the global context referred to above. It is mainly focused on its impact on agricultural production, particularly on family agriculture. It evaluates proposals by products

and characterizes actors involved, implications for land use (taking into account the landholdings structure) and impacts on ecosystems. By focusing on threats and opportunities for family agriculture, we intend to provide inputs to movements and organizations.

THE AGROFUEL RANKING

MAIN BIODIESEL AND ETHANOL PRODUCERS

WHAT THEY ARE: agrofuels are liquids or gases produced from vegetal raw materials

BIODIESEL

- Refined from soybean oil, castor bean, palm oil and other oil seeds
- It can replace diesel from petroleum
- It doesn't require adaptations in engines

ETHANOL

- Produced from plants such as corn and sugarcane
- It can replace petroleum in adapted engines
- It can be blended with gasoline and used in conventional engines

ETHANOL: PRODUCTION IN 2006, IN MILLION LITERS

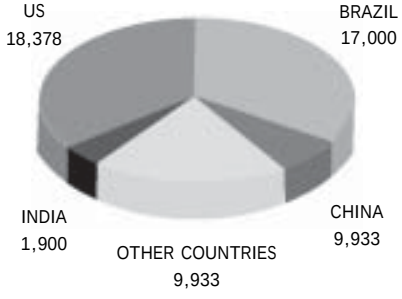
US	18,378	Ukraine	269	Guatemala	49
Brazil	17,000	Saudi Arabia	197	Mexico	49
China	3,850	Argentina	170	Cuba	45
European Union	2,984	Indonesia	170	Ecuador	45
India	1,900	Australia	148	Nicaragua	30
Russia	647	Japan	114	Zimbabwe	26
Canada	579	Pakistan	91	Kenya	19
Thailand	352	Philippines	83	Swaziland	19
South Africa	386	South Korea	61		

GLOBAL PRODUCTION IN 2006, IN MILLION TONS

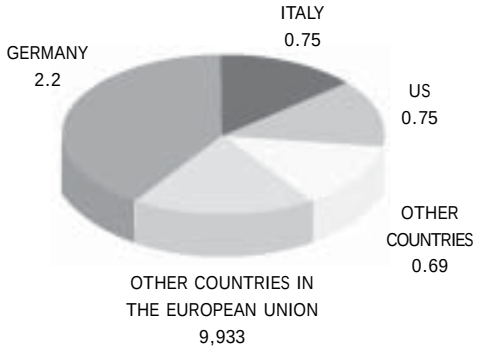
1 ton = 1,185.9 liters

MAIN PRODUCERS IN 2006

ETHANOL / TOTAL = 51,061 LITERS



BIODIESEL / TOTAL = 5.4 MILLION TONS



Reuters

Agrofuels in Brazil

1. PROÁLCOOL

The National Alcohol Program (PROÁLCOOL), iniciated in 1975 in response to a four-fold rise in petroleum prices, turned Brazil into a pioneer in the production of energy from biomass. Although other raw materials were tested (particularly manioc), PROÁLCOOL was based on sugarcane, of which Brazil is the most competitive producer in the world in terms of costs. In the first years, the objective was to add anhydrous alcohol to gasoline. Production increased from 600 million liters a year in 1975 to 3.4 billion liters a year between 1979 and 1980. During this period, ethanol was produced in distilleries located next to sugar mills.

After the second petroleum shock, the program's objectives became more ambitious and focused on producing ethanol-fueled cars. In 1986, over twelve billion liters were produced for a fleet which by then was mostly made up of ethanol-fueled cars (over 75%), which stimulated specialization in producing ethanol in autonomous distilleries. Petroleum prices began to fall in that year, undermining the program's feasibility, which was also affected by a fiscal crisis. Ethanol production stagnated, while demand remained at the same levels, a situation that led to a supply collapse late in the 1980s. Confidence in the program vanished, and this fact was reinforced by a liberalization context which changed the car market as a result of the globalization of production and marketing strategies, making it difficult to adopt strategies exclusively focused on domestic markets. During the 1990s, petroleum prices remained low and the ethanol market was fully deregulated. The production of ethanol-fueled cars virtually came to an end; Brazil became a major sugar exporter, increasing its production from 1.1 million tons early in that decade to over ten million tons in the second half of the decade.

Today, a set of factors has given new life to ethanol produced from sugarcane: a hike in petroleum prices, which is not seen as a temporary phenomenon, the development of *flex* cars, and the targets set by industrialized countries to replace gasoline by ethanol at different percentages. This scenario brought positive prospects for a global ethanol market, at a moment that was also favorable for sugar exports. As opposed to previous periods, ethanol production is being resumed at the initiative of the private sector, particularly with a strong (and predominant tendency of) presence of foreign investments from different countries and industries (including clearly speculative capital). Currently, Brazil produces seventeen billion liters of ethanol and 26 million tons of sugar, a volume which, according to the União da Indústria Canavieira de São Paulo - UNICA (*Sugarcane Agroindustry Union of São Paulo*), is expected to increase to 27 billion liters of ethanol and 33 million tons of sugar by 2010.

Although regulation was historically available to ensure the participation of small and medium-sized sugarcane suppliers in it, this industry is now dominated by large plantations provided with mills both in the south region (and now in the mid-west region) and in the northeast region. The activity employs a huge amount of workers, particularly sugarcane cutters. Harvest mechanization, which was traditionally seen as a threat to the organization of workers, is now beginning to be adopted under the impact of regulation designed to prevent burning practices. However, even in São Paulo it is estimated that 40% of all the land occupied by sugarcane plantations are not appropriate for mechanization. In order to achieve the production expansion targets that were set, it is estimated that sugarcane will have to be cultivated on over 2.5 million hectares. New investments are calculated at US$ 3 billion for forty industrial plants that have plans to create 360,000 new direct jobs and 900,000 indirect jobs.

Inadequate working conditions in sugarcane plantations have been reported since the beginning of the sugarcane cycle in colonial Brazil, and a similar situation is being reported today as this industry is once again expanding. While this text was drafted, sugarcane cutters were starting a general strike, the first one since 1986. "They claimed a base monthly salary of R$

1,600 (today it is R$ 450.00), a 30-hour workload (today it is about 44 hours), the end of the system of being paid by each ton of sugarcane that they cut (they want to be paid by the meter), medical and social assistance, rest and meal breaks, more safety in the workplace and in their transportation." (*Açúcar Ético*, 2007) According to a story by journalist Marina Mendes, "the value of each meter of sugarcane that is cut is the same since 1996: R$ 0.10. "Usually, it takes nine hours for sugarcane cutters to cut two hundred meters." (*Agência Notícias do Planalto*, 2007) As for labor rights, Guilherme Maciel, from the National Coordination of the Movimento dos Pequenos Agricultuores – MPA (*Small Farmers Movement*), reports: "the conditions in most sugarcane plantations today are very precarious for workers and they have no guaranteed labor rights. They are similar to slave labor conditions. People work hard and for long hours and when they cannot work anymore they leave without any rights. Their contract model does not ensure labor rights. In six months, they become unemployed and have no right to any unemployment insurance." (*Agência Notícias do Planalto*, 2007.) These workers are claiming a temporary contract that can guarantee rights such as unemployment insurance.

Since the PROÁLCOOL program was launched, discussions are being held on the issue of the extent to which the expansion of sugarcane plantations has displaced food crops. Today, sugarcane seems to be displacing or replacing whole industries, such as the milk, the orange and the livestock industry, particularly in the state of São Paulo. In the state of Paraná, concerns have been raised over the encroachment of sugarcane plantations on areas where corn and wheat crops were traditionally grown. Most new plants in São Paulo are being set up in the western region of the state, displacing livestock farms. According to a study by Sidnei Gonçalves, there is a strong correlation between the expansion of sugarcane plantations in São Paulo and of livestock farms in the Amazon region, with direct impacts on the deforestation pace (Gonçalves, 2007). Other studies, however, challenge these arguments by pointing out a trend to combine grain crops with cattle-raising schemes under a system, which has been increasingly sparing land areas (FAO/ECLAC).

Ethanol-related business was one of the factors that led to a 66% increase in the entry of registered capital into the country between the first quarter of 2007 and the first quarter of 2006, totaling 6.5 billion dollars according to the Central Bank. The Datagro consulting firm reported that foreigners have invested 2.2 billion dollars in this industry since 2000. Of the ten largest sugar and ethanol companies in Brazil, four involve foreign capital (Cosan, Bonfim, LDC Bioenergia and Guarani), and a fifth one, Santa Elisa, developed a partnership with the American company Global Foods recently to set up the Companhia Nacional de Açúcar e Álcool – CNAA (*National Sugar and Ethanol Company*), which has plans to invest R$ 2 billion in building four plants in the states of Goiás and Minas Gerais (*Unisinos Notícia*[2], 06/18/07). Within five years, ethanol is expected to become a commodity *(Unisinos Notícia*[3]*, 06/08/07).*

2. The Biodiesel Program

Although the sugar/alcohol industry is managed by private initiative today, the PROÁLCOOL program was developed as a public policy during fifteen years. In the early stages of the PROÁLCOOL program, timid initiatives were launched to exploit other crops (PETROBRAS developed a manioc-based pilot project) based on a more diversified policy in terms of beneficiaries. Shortly thereafter, however, the program consolidated itself around sugarcane and large-scale production schemes.

[2] http://www.unisinos.br/_ihu/index.php?option=com_noticias&Itemid=18&task=detalhe&id=7845
[3] http://www.unisinos.br/_ihu/index.php?option=com_noticias&Itemid=18&task=detalhe&id=7668

Table 1
Types of foreign capital being invested in the ethanol industry

TYPES OF FOREIGN CAPITAL	
A - Consortia of international companies and investment funds interested in investing in a promising business, but without any direct involvement in its operation.	**B -** Companies that are already active in the sugar/alcohol industry abroad and 'tradings' which are participating or want to participate more actively in the international ethanol trade.
EXAMPLES	EXAMPLES
George Soros (Hungarian mega-investor): an associate of Adecoagro company, which bought the Monte Alegre Plant in the state of Minas Gerais in 2006 and is building a new plant in the state of Mato Grosso do Sul. The company has plans to invest R$ 1.6 billion to achieve the capacity to process 11 million tons of sugarcane by 2015. **Vinod Khosla** (Indian billionaire): associate of the Brazil Renewable Energy Company (BRENCO), a company established in March by Henri Philippe Reichstul, former president of PETROBRAS. **James Wolfensohn** (Australian, former president of the World Bank): a foreign associate of the Brenco company, which has plans to invest US$ 2 billion in ethanol production in Brazil. **Kidd & Company:** controlling shareholder of the COOPERNAVI plant and shareholder of the company Infinity BioEnergy together with the US company Merrill Lynch and the international investment funds Stark and OchZitt Management. **Infinity BioEnergy:** owner of four plants in Brazil. In its first equity raising abroad, in 2006, it raised US$ 300 million to be exclusively invested in the Brazilian sugar/alcohol industry.	**Tereos and Louis Dreyfus** (French, the first ones to arrive, in 2000): Louis Dreyfus is the controlling shareholder of the Luciânia plant, in the state of Minas Gerais, and of the Cresciumal and São Carlos plants, in the state of São Paulo; in February 2007, he bought four plants from the Tavares de Melo group, from the state of Pernambuco, and began to build a fifth one in the state of Mato Grosso do Sul. Tereos has a 6.3% shareholding in the Cosan company, which he intends to increase in 2007, besides a 47.5% shareholding in the company Franco-Brasileira de Açúcar (FBA) and a 100% shareholding in the Açúcar Guarani company. **Cargill** (American): turnover of R$ 10.9 billion in Brazil in 2006. In June 2006, the company acquired controlling shareholding in the company Central Energética do Vale do Sapucaí (CEVASA), a plant located in Patrocínio Paulista, in the state of São Paulo, at an estimated amount of R$ 75 million. **Bunge** (already operates as a sugar and ethanol exporting company in Brazil): Made attempts to buy the Vale do Rosário plant, the third largest sugar and ethanol producer in Brazil. Despite the initial refusal of its controlling shareholders to sell the plant, Bunge had not given up the idea of striking an agreement until June 2007. **Pacific Ethanol:** the associates of the company include the billionaire Bill Gates, the German company NordZucker SudZucker, which operates in the sugar industry in Europe, and the Indian company BHL, owner of plants in India, which hired the KPMG consulting firm to coordinate its expansion to Brazil.
Demand is so high that price inflation can be felt already. In the race not to stay out of this market, those who want to buy a Brazilian plant today must be willing to pay more than double the average price in 2005, which was US$ 40 per ton of sugarcane crushing capacity. Even with prices rising at such a fast pace, many are willing to pay what it takes.	

Source: *Unisinos Notícia*, 06/08/07 and 06/18/07.

Table 2
Comparison of the situation in the United States and Brazil in the future

US	BRAZIL
Current production: 18 billion liters from corn (6 million ha). Industrial Units: 97	Current production: 16 billion liters from sugarcane, in 357 units in operation (43 other units are being built).
Target: reducing the consumption of fossil fuels by 20% by 2017.	Advantage: sufficient area to multiply plantations and meet the expected increase in demand in coming years.
Cost for producing ethanol: US$ 0.30 /l	Cost for producing ethanol: US$ 0.22/l (EU: US$ 0.53/l)
Demand for ethanol by 2017: it may hit the mark of 132 billion liters a year (over three times the current world production).	Future: Increase in crushed sugarcane in Brazil from 473 million tons in the next harvest to 700 million tons in 2014, which will require investments in 114 new plants, according to the DATAGRO company.

Source: *Unisinos Notícia*, 06/18/07, and GMF (2007).

The Programa Nacional de Produção e Uso do Biodiesel – PNPB (*National Biodiesel Production and Use Program*) defines itself as a self-sustainable energy project which considers aspects related to the price, quality and ensured supply of biodiesel and was designed to create jobs and income with social inclusion and environmental sustainability, using different oil seeds selected according to the region. Officially launched in December 2004, it is an initiative of the federal government, managed by an executive inter-ministerial committee, coordinated by the Presidential Staff Office and made up of representatives of fourteen federal departments. Its operationalization is under the responsibility of the Ministério das Minas e Energia – MME (*Ministry of Energy and Mining*), the coordinator of the PNPB Managing Group, which is also made up of representatives of fourteen federal ministries and of the Agência Nacional de Petróleo, Gás Natural e Biocombustíveis – ANP (*Agency of National Petroleum, Natural Gas and Biofuel*), PETROBRAS, EMBRAPA and BNDES.

Law 11,097, of January 13, 2005, introduced biodiesel in the Brazilian energy matrix and designated ANP as the agency in charge of regulating its production and marketing. This law defines biodiesel as a renewable fuel made from biomass for use in compression-ignited internal combustion engines or, according to a regulation, for generating energy of another kind that may replace fossil fuels partially or fully. Therefore, biodiesel can be used in automotive engines (trucks, tractors, vans, cars, etc.), in transportation means (river and railway transportation means) and in stationary engines (electricity-generating companies, etc.). It can also replace other types of fossil fuels in energy generation, such as in boilers and heat generation in industrial processes.

The PNPB program is not restrictive: many different oil seeds or animal raw material can be used under it. This flexibility makes it possible for agribusiness and family agriculture to participate in it and for land available for agriculture to be used in the best way possible. Regardless of the raw material and technological path that is used, biodiesel was introduced in the domestic fuel market with unique specifications. Even though each oleaginous plant has its own features, biodiesel produced from castor bean, soybeans, palm, fat or sunflower can meet the quality defined by ANP.

It should also be highlighted that biodiesel will only be actually sold to customers in gas stations if it meets the technical specifications set out in Brazilian rules (Resolution ANP n. 42/04). Adding 2 per cent biodiesel to diesel from petroleum will not require changes in the engines, as it was not required in countries that use this fuel already. Engines which begin to use biodiesel blended with fossil diesel at this percentage have a factory guarantee endorsed by the Associação Nacional dos Fabricantes de Veículos Automotores – ANFAVEA (*National Association of Vehicle Manufacturers*), as this organization formally announced to the federal government.

In the case of exports, biodiesel is required to comply with international quality rules applied to its use and production as well. The technical specifications set by the European Union (EU) based on the performance of biodiesel from colza (which is different from the Brazilian palm oil and castor bean) have hindered the entry of the Brazilian product into European countries and can constitute an additional setback for the domestic industry in 2008. For this reason, the director of ANP, Victor Martins, announced in June 2007 that he is considering the possibility of reviewing Resolution n. 42, which deals with specifications for biodiesel, with the aim of harmonizing the Brazilian specifications with international specifications based on the use of domestic raw materials. Technical specifications will surely be the tricky element of the new agrofuel market. Since agrofuels are made from agricultural products, they can have very distinct chemical features. Harmonizing these rules will turn agrofuels into commodities, allowing them to be traded in stock exchanges and their quality to be inspected.

In addition, the European Commission is considering new measures to set a minimum sustainability standard. Paul Hodson, an authority of the Commission involved in the work of turning these objectives into law, listed three criteria that might be included in the laws of the European Commission. First, the product would be required to reduce gas emissions at a minimum level as compared to a fossil fuel, from its production to its use. Second, lands used for producing agrofuels should not be located in swamp areas, which would normally store carbon if they were not used. Third, areas used for this purpose should not be home to a variety of plants or animals (which the representative of the European Commission referred to as having a "high biodiversity quota"), which would have to be displaced or destroyed to be cultivated. The law should also seek to foster the so-called "second generation" of agrofuels, the raw material for these would be cellulose and which would have a greater weight in the analysis of whether targets were achieved or not. In addition to environmental aspects related to the production and consumption of fuels, discussions are also being held on a social certification system designed to avoid over-exploitation of labor and other human rights violations.

The two per cent biodiesel mixture with diesel from petroleum is called B2, which will be successively increased until pure biodiesel, referred to as B100, is used. Law n. 11,097/05, passed by the National Congress, set the deadline of January 2008 for the B2 mixture to become compulsory in Brazil. Therefore, all the diesel oil traded in Brazil will be required to contain biodiesel at a percentage of 2% on a compulsory basis. In January 2013, this percentage will be increased to 5%. It should be mentioned that, according to the evolution of the industry's productive capacity and to the availability of raw materials, among other factors, these deadlines can be moved up through a resolution issued by the Conselho Nacional de Política Energética – CNPE (*National Energy Policy Council*), as provided for in the law.

On the other hand, Resolution ANP n. 19 of June 22, 2007 authorized the use, without prior authorization from ANP, of non-specific fuels ("a product or mixture containing one or more fuels specified by ANP to replace any regulated fuel") in the captive fleet or in industrial equipment items for the purpose of evaluating and comparing them to the fuel to be replaced, if the monthly consumption does not exceed 10,000 liters. The monthly consumption of the non-specified fuel was limited to a maximum volume of 100,000 liters.

In its Resolution n. 03 of September 23, 2005, the CNPE moved up the deadline for the B2 requirement to January 2006 and its trade was restricted to the volume of biodiesel produced by

Table 3
Raw materials used for producing biodiesel (until June 2006)

Oil seeds	Production (million liters)	Share
Soybeans	498	59%
Castor bean	218	26%
Other	124	15%

Source: MDA/SAF.

Table 4
Targets of the Social Fuel label according to the auctions (until September 2006)

Region	Million of liters bought	Number of Family Farmers (FF)	Averagen° of ha. FF	Total Revenue FF (R$)	% of the production by region
Mid-West	117.3	3,726	5	30,175,457.14	14%
Southeast	147.4	7,214	5	35,649,034.00	18%
North	97.2	5,414	6	19,016,326.00	12%
South	160.0	13,810	8	96,514,285.71	19%
Northeast	318.6	175,611	3	169,950,000.00	38%
Brazil as a whole	840	205,471		349,226,069.00	100%

Source: MDA/SAF.

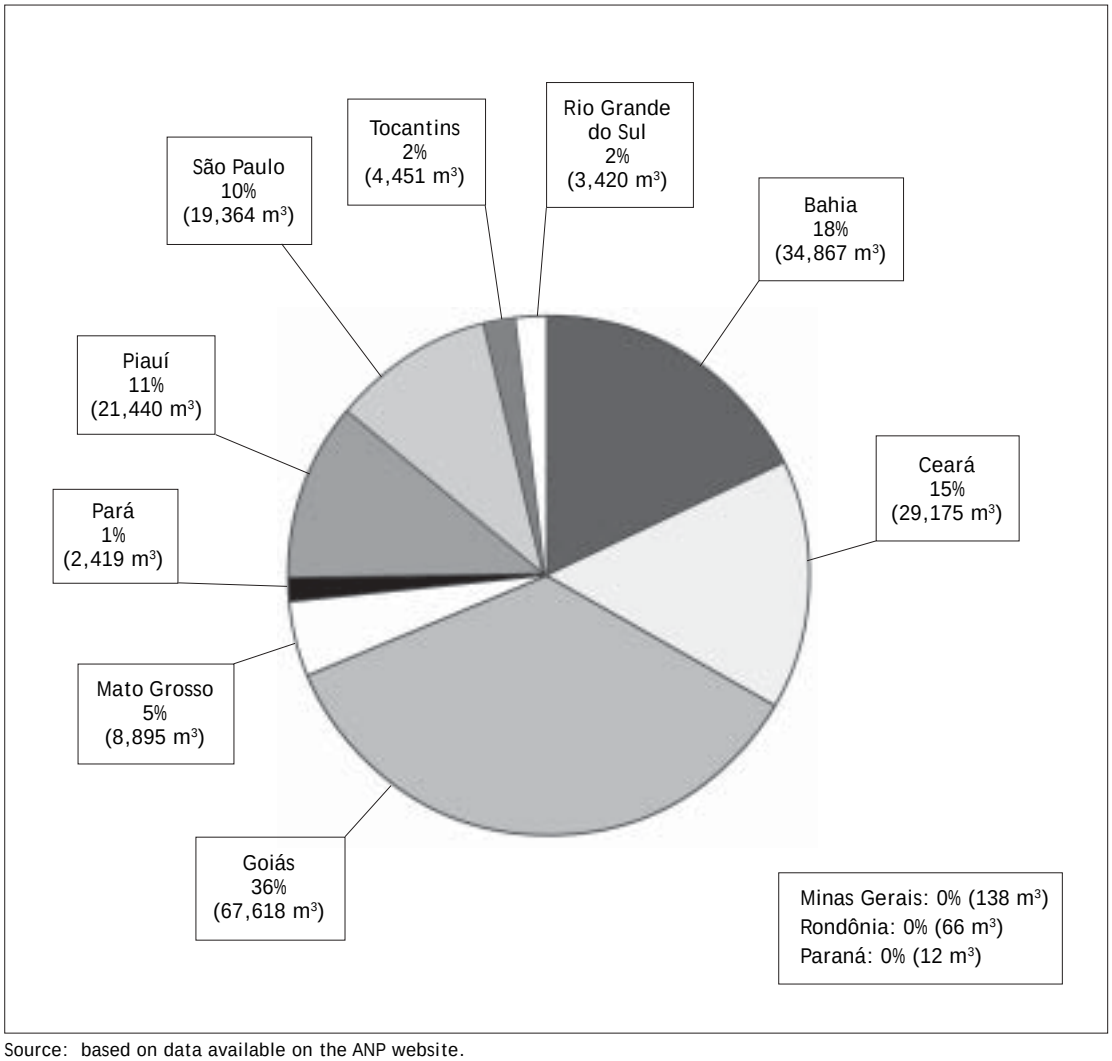
companies that were awarded the Social Fuel label, through public auctions held by ANP. The auctions were structured in such a way as to increase the participation of biodiesel in the domestic energy matrix, in tune with the economic, social and environmental policies adopted by the federal government; to stimulate investments in the biodiesel production and trade chain; and to allow for the combined participation of family agriculture and agribusiness in the supply of raw materials. The results achieved until the fourth auction was held, in June 2006, are described in tables 3 and 4. The announcement of a sixth auction is being expected now.

Currently, there are 41 biofuel producing units in Brazil, which can supply approximately 1,848 million liters of the product. This volume exceeds the total necessary (840 million liters) for the 2% mixture, known as B2 that will be enforced in 2008. For the B5 mixture, that is, the 5% renewable oil mixture to be used by 2013, the government estimated in its national biofuel policy that the supply of the product should amount to approximately two billion liters. In October 2007, there were forty other plants waiting for the authorization from ANP to begin to operate.

According to ANP, the amount of biodiesel produced in Brazil is much below the authorized capacity. The biodiesel production capacity authorized until early September was 1,848 million liters. Since production up the end of August amounted to approximately 192 million liters (ANP data), the plants used only 10% of their authorized capacity. Factors that may have influenced the idleness of the Brazilian plants include the price of soybean, the main raw material used for producing biodiesel.

Figure 1

Participation of the states in the production of B100 biodiesel, from January to September 2007 (in % and m³)



Source: based on data available on the ANP website.

Biodiesel production in 2007 was almost fully concentrated in two companies, namely, Brasil Ecodiesel and Granol, which accounted for 77% of all the Brazilian production (91% of the production in the first quarter). Production became concentrated in just a few companies since ANP began to register it. The main biofuel-producing state is Goiás, where the plants belonging to the Granol and the Caramuru companies are located, totaling 35% of the domestic production. The states ranking second are the ones where plants owned by the Brasil Ecodiesel company are located: the states of Bahia (18%), Ceará (15%) and Piauí (11%).

According to ANP data, Brazil produced 154.6 million liters from January to July 2007. From July to August, the domestic biodiesel production increased by 41%; the manufactured volume increased from 26,340 to 37,258 cubic meters, the highest monthly growth ever registered in the country.

The Social Fuel label is an identification component awarded by the Ministério do Desenvolvimento Agrário – MDA (*Ministry of Agrarian Development*) to biodiesel producers which promote social inclusion and regional development through job and income generation

for family farmers meeting the criteria set by Programa Nacional de Fortalecimento da Agricultura Familiar – PRONAF (*National Program for Strengthening. Family Agriculture*).

As a result of the social connotation attached to the National Biodiesel Production and Use Program, the focus in the northeast region has been on producing castor bean, while in the north region it has been on producing palm oil. As a raw material fully adaptable to the semi-arid region, castor bean is an alternative crop for family agriculture, which is the main justification for choosing it. In this case, biodiesel is expected to be used as an instrument for generating income in rural areas.

Table 5
PIS, PASEP and COFINS aliquots applied to biodiesel, in R$/l of biodiesel

	Social Fuel label	
	Without	With
North, northeast and semi-arid regions:		
Castor bean and palm oil Other raw materials	R$ 0.15 R$ 0.218	R$ 0.00 R$ 0.07
Mid-west, southeast and south regions:		
Any raw material, including castor bean and palm oil	R$ 0.218	R$ 0.07

Source: MDA

Table 6
List of companies that were awarded the Social Fuel label up to March 2007 and the respective biodiesel volumes sold in ANP auctions

Industrial units	Municipality/ Unit of the Federation	Production authorized by ANP (million l/year)	Volume sold in auctions (million l/year)
Granol	Anápolis/GO	100	64
Granol	Campinas/SP	39.9	20.1
Soyminas	Cássia/MG	12	8.7
Biocapital	Charqueada/SP	55.8	60
Fertibom	Catanduva/SP	12	6.0
Cia Refinadora da Amazônia	Belém/PA	24	7.2
Brasil Ecodiesel	Crateús/CE	108	92
Brasil Ecodiesel	Floriano/PI	40.5	78
Brasil Ecodiesel	Iraquara/BA	108	106
Brasil Ecodiesel	Teresina/PI	0.6	0.0
IBR Inoquímica of Brazil	Simões Filho/BA	19.5	9.0
Barralcóol	Barra do Bugre/MT	50	10
TOTAL		570.3	461.0

Source: MDA (2007) and ANP.

Table 7
List of companies that won ANP auctions until March 2007 but had not been awarded the Social Fuel label up to those date

Industrial units	Municipality/ Unit of the Federation	Production authorized by ANP (million l/year)	Volume sold in auctions (million l/year)
Binatural	Formosa/GO	9.0	1.32
Agrosoja	Sorriso/MT	24.0	5.0
Renobras	Dom Aquino/MT	6.0	0.9
Caramuru	São Simão/GO	112.5	40.0
Fiagril	Lucas do Rio Verde/MT	40.5	27.5
Ponte di Ferro	Rio de Janeiro/RJ	48.0	31.0
Ponte di Ferro	Taubaté/SP	27.0	19.0
Biominas	Itaúna/MG	12.0	2.65
Brasil Biodiesel	Porto Nacional/TO	100.0	90.0
BSBios	Passo Fundo/RS	100.0	66.63
Brasil Biodiesel	Rosário do Sul/RS	100.0	80.0
Oleoplan	Veranópolis/RS	100.0	10.0
Brasil Biodiesel	Itaqui/MA	100.0	50.0
TOTAL		779.0	424.0

Source: MDA (2007).

Table 8
List of companies that applied for social benefits for their projects until March 2007 (planned projects and undertakings under way)

Industrial units	Municipality/ Unit of the Federation	Capacity (million l/year)
Bionasa Combustível Natural S/A	Porangatu/GO	110
Biocamp Ind. e Com. Imp. Exp. de Biodiesel Ltda	Campo Verde/MT	50
Bio Mundo Indústria e Com. de Biodiesel Ltda	Novo Mundo/MT	54
Bio Fisher Indústria e Com. de Biodiesel Ltda	Colíder/MT	54
Agrenco do Brasil S/A	Maringá/PR	130.6
Agrenco do Brasil S/A	Rondonópolis/MT	186
Agrenco do Brasil S/A	Maracaju/MS	108.3
Bertin Ltda	Lins/SP	100
Bionorte	S. Miguel do Araguaia/GO	25
Ambra	Varginha/MG	5.28
TOTAL		823.18

Source: MDA (2007).

Table 9
Impact of governmental actions on family agriculture (FA) until March 2007

PARAMETER	AMOUNT
N. of undertakings with the label	11 undertakings
Total nominal capacity	567.9 million liters a year
Total volume sold in auctions	406.58 million liters a year
Total number of hired FFs	63,481 family farmers
Total area hired	206,342 hectares
Main oil seeds produced by FFs	70% of the area planted with castor bean, 24% with soybeans, 5% with palm oil and the rest with sunflower
Estimate of hired FFs based on auctions held up to March 2007	It is expected that 210,000 family farmers will have been hired by the 2007/08 harvest in an area with more than 600,000 ha.
Income increase	The biodiesel program is still not provided with a data series to infer the income increase for family farmers, as it is between the first and the second harvest of crops grown for this purpose. However, an impact on their income can be observed already. In the case of palm oil, which is cultivated in degraded areas in the state of Pará, the average net income which has been measured already is R$ 31,900.00 a year per settled farmer who had no registered income before (that is, a farmer with a profile A can rise to profiles C or D due to this activity). In the case of castor bean grown in the northeast region, where productivity is still low, planted areas are small and the profile of the farmers is B, the net annual income is about R$ 1,060.00. It is a low income in absolute figures, but it represents an increase of 35% if one considers that the gross annual income of family farmers is R$ 3,000.00. This performance can be improved a lot as the farmers access certified seeds and credit made available under the PRONAF to adopt recommended agricultural practices.
Involvement of social and union organizations	More than eleven family agriculture cooperatives signed contracts with companies that were awarded the Social Fuel label.The CONTAG system is actually intermediating negotiations between companies and family farmers. For this purpose, it trained its federations and unions and is preparing itself to involve cooperatives in the secondary sector of this chain. FETRAF, MPA and the Landless Movement have adopted an action strategy to meet the demand from PETROBRAS in their future biodiesel units in the states of Ceará, Bahia and Minas Gerais. The MPA is studying a business plan for producing oil and biodiesel in the state of Rio Grande do Sul.
New oil seeds	A zoning timeline was agreed upon with MAPA to be met by 2010 focused on oil seeds. As a result of this understanding, for example, areas for growing sunflower have been zoned in the states of Tocantins, Maranhão, Piauí, Goiás, Mato Grosso and Mato Grosso do Sul and for cultivating palm oil in the state of Bahia.

Source: MDA (2007).

It affords the following benefits to biodiesel producers:

- access to some tributes (PIS, PASEP and COFINS) aliquots with differentiated reduction coefficients (table 5);
- access to better financing conditions provided by BNDES and its registered financial institutions, by BASA, BNB, Banco do Brasil or other financial institutions providing special funding conditions to projects which were awarded the Social Fuel label; and
- the possibility of taking part in biodiesel auctions.

A biofuel producer that is awarded the Social Fuel label has the following obligations:

- buy raw materials for producing biodiesel from family farmers at a minimum amount defined by the Ministry of Agrarian Development;
- enter into contracts with family farmers, negotiated with the participation of representatives of family farmers, setting out trading conditions designed to ensure an income and terms of delivery that are consistent with the activity; and
- provide technical assistance and training to family farmers.

These biofuel producers are required to buy at least 50% of the raw materials they use for producing biodiesel from family farmers in the northeast and semi-arid regions. This minimum percentage is 30% in the southeast and south regions and 10% in the north and mid-west regions.

According to MDA/SAF, twenty industries have been awarded the Social Fuel label so far, and the Soyminas company lost the award early in 2007.

Investments already made or yet to be made reveal the interest of the corporate sector in producing biodiesel with the Social Fuel label. This interest is largely motivated by the biodiesel tax policy and also by the public auctions, that are restricted to companies with the label.

Until September 2007, over 91,000 families of farmers had been integrated into the biodiesel production chain in the country. “Everything that was contracted and bought from these families would amount to approximately 24% of the total biodiesel volume if all this raw material was actually used for this purpose,” Arnoldo Campos, coordinator of the ministry’s National Biodiesel Program, reported to the newspaper *O Estado de São Paulo* early in September.

Table 10
Some features of raw materials available by region

Species	ha/family	Region	% of oil
Family castor bean	2	NE; MW; SE.	45 – 50
Mechanized palm oil	5	N; NE; MW.	22
Extractive babassu	5	NE.	66
Mechanized peanut	16	SE.	40 – 43
Mechanized soybeans	20	N; NE; MW; SE; S.	18
Colza/canola	-	S.	40 – 48
Coconut	-	NE.	55 – 60
Sunflower	-	MW; SE; S.	38 – 48
Cotton	-	NE; MW; SE; S.	15

Note: N: North; NE: Northeast; MW: Mid-West; SE: Southeast; S: South. Source: Holanda, 2004, and Nogueira, L. A. H. *et al.*, Agência Nacional de Energia Elétrica (*Brazilian Electricity Regulatory Agency*), adapted by DPA/MAPA.

The families included in the chain account for an area of 538.2 thousand hectares planted with oil seeds. Over half of them (51%, accounting for 46.6 thousand farmers) are in the northeast region of the country. The south region has 31.4 thousand families of farmers and 8,000 of them are in the mid-west region. However, the mid-west region concentrates 48% of the planted area, 258,000 hectares. In the north region, there are 4.2 thousand farmers. Only seven families are involved in biodiesel-producing schemes in the southeast region.

Almost half (49%) of the oil seeds planted by these families consists of castor bean, followed by soybeans (29%), sunflower (14%), palm oil (5%), sesame and peanut (1%).

Main actors and their positions

1. Family farmers and peasants

- A number of farmers in the state of Ceará were victims of an unfulfilled promise of the company Brasil Ecodisel, the most important one in the industry, to that it would buy the raw material from them. So they planted castor bean and could not sell it, or were forced to sell it at a below-profit price. This episode discouraged many other potential farmers and brought discredit to the PNPB. Based on the results of field visits to rural areas of that state in 2007, although castor bean is still a familiar crop, farmers have mixed feelings about whether growing castor bean under the PNPB can ensure jobs and local development.

- "Although castor bean is a productive crop and the most appropriate one for Brazil's northeast region, the federal government will have to create mechanisms for purchasing the raw material from farmers in order to strike a balance. In 2004, I grew castor bean and harvested it expecting to sell it for R$ 0.80/kg, the price that the government said it would buy it for. I ended up selling it for R$ 0.35/kg in December 2006 to be received in 30 days. I believe in the program, but it should be based on a serious and respectful policy in relation to farmers. If things remain as they are, I DON'T believe the program will work and those who grow crops without any support will suffer damages and will remain at the mercy of middlemen, jeopardizing the much-expected salvation of our northeast region, which offers many alternatives that, in practice, are difficult to implement," wrote José Braz Neto on March 2, 2007 on the website biodieselbr.com (http://www.biodieselbr.com/noticias/mamona/governo-quer-plantar-40-mil-ha-de-mamona-01-03-07.htm).

- In the southern part of the state of Santa Catarina, farmers in different municipalities began to grow sunflower and castor bean crops under a project involving the Federation of Agricultural Workers of the State of Santa Catarina (FETAESC) and the Brasil Ecodiesel company. In the Turvo municipality, families were affected by pests in their crops and had no technical assistance. However, "we don't want to give up without a fight. We are just beginning and still learning," said David Tomas, president of the rural workers' union of Turvo and Ermo. According to him, besides allowing for a greater diversity of crops in small farms, sunflower offers family farmers an alternative to just growing crops. "We have plans to strengthen farmers to produce and market the product, thereby increasing the profitability of their farms," he reported. For this purpose, more farmers would have to join the scheme to grow the crop and than set up a cooperative (*A Tribuna*, 06/22/07).

- In view of the visit of the US president, George W. Bush, to Brazil to discuss ethanol-related issues, social movements support agrofuel production, provided that it benefits family farmers and is not based on the agroexporting model.

■ **MST:** "We have made progress in the understanding that we will support the production of energy from agricultural products, but only as long as it doesn't replace food production and doesn't use food products such as corn and soybeans. It should be based on products that do not compete with food products," said João Pedro Stédile, leader of the Movimento dos Trabalhadores Rurais Sem Terra (*Landless Movement*) and of Via Campesina Brazil at the World Forum on Food Sovereignty, which was held late in February 2007 in Mali.

- The name "biofuel" should be replaced by "agrofuel," so as to identify the origin and provide a basis for regulation, Stédile stressed.
- "Agribusiness can grow soybeans, sugarcane, corn and cotton for energy purposes, but it will do so on a non-sustainable basis, using a pesticide-intensive and monoculture-based model. This model has evil consequences, since, similarly to petroleum, it has been confirmed that agribusiness contributes a lot to global warming," he argued.
- There are two agrofuel production models:

1) The model "of the dominant class, of large capitalists, who built an alliance made up, on the one hand, by multinational corporations and, on the other, by large Brazilian landowners." According to Stédile, the international capital that is used is concentrated in the hands of transnational petroleum companies, corporate agribusiness groups and car manufacturers. The movement says that it is a variant of agribusiness which concentrates land ownership even more and fosters the growth of large rural properties, leading to the migration of food crops due to the attraction of higher profits. In recent months, the Cargill company, for example, bought the largest ethanol plant in São Paulo, located in a 36-thousand hectare area exclusively planted with sugarcane.

2) The MST supports another model, "focused on the needs of the people, on settling peasants in rural areas, on developing policulture-based models and on growing food crops on a priority basis, without using pesticides," Stédile said.

- Each locality should seek its own energy solutions, so as not to depend on energy imports.
- There should be a public state enterprise in charge of developing a policy to commercialize energy (including agroenergy) in tune with the interests of the population and not of capital.

■ **"Another position":** José Rainha Júnior, leader of the MST, announced an unprecedented partnership with foreign companies operating in the agribusiness industry to market the production of biodiesel. According to the landless leader, the plan is endorsed by president Lula and contemplates public funds: the government will pay one minimum wage a month to each participating family and will also finance the establishment of crops at a cost of R$ 50 million in ten years. They will grow *Jatropha curcas*, an oleaginous plant that UNICAMP considers appropriate to be cultivated in the region. The monthly minimum wage will be paid during the first three years of the project. "It will support the families until production actually begins." Rainha wants the Federação das Associações dos Assentados e Agricultores Familiares do Oeste Paulista – FAFOP (*Federation of Associations of Settled Populations and Family Farmers of the West Region of the State of São Paulo*), which was set up to represent settled groups, to control 60% of the industry. The idea is to begin with 2.5 hectares per family, until 60,000 hectares are set apart for this purpose over a ten-year period. According to Rainha, the families will share the income from biodiesel, which would be exported to Portugal and Spain with an average assured income of R$ 1.2 thousand a month. "We want to sell the oil, not the raw material," he said. Although flags of the Movement were flying from over 30 masts, the MST refused to endorse the project. No senior public manager attended the event. "This is a project proposed by Rainha and the Federation, not by the Landless Movement," said Valmir Rodrigues Chaves, a member of its National Board.

■ **Via Campesina:** "There is no governmental program with production lines, criteria and guidelines pointing to a new agricultural model. In addition, the biodiesel program is being left in the hands of a group of private corporations that want to buy grains from farmers without adding any value to rural communities. And they are once again fostering a monoculture-based model," criticized Father Sérgio Gorgen, a leader of Via Campesina in Brazil.

■ **FETRAF:** The Federação dos Trabalhadores da Agricultura Familiar – FETRAF (*Federation of Workers in Family Agriculture*) is implementing a Program for the Production and Use of Renewable Energy in Family Agriculture. According to the Federation, the participation of family agriculture in this process should take into account the following aspects:

- Guaranteed diversity and food crops in combination with oil seed crops.
- Production of vegetal oil under family agriculture schemes as a strategy to foster autonomy in the use of fuels.
- Agroecological production.
- Participation of young people, women and elderly people in production and social organization processes.
- Appreciation for local crops.
- Preservation and recovery of natural resources.

(http://www.fetraf.org.br)

■ **CONTAG:** The Confederação Nacional dos Trabalhadores na Agricultura Familiar – CONTAG (*National Confederation of Agricultural Workers*) wishes that at least half of the biodiesel is produced by family farmers. Its secretary for Agricultural Policy, Antoninho Rovaris, explained that the objective of the union movement is to include family agriculture in all the agrofuel production chain: "We are working to make sure family agriculture is not just a supplier of raw materials. We have plans to set up cooperatives and not to restrict our activities to producing raw materials, as we want to be able to crush them and, if possible, separate biodiesel from the paraffin, from the raw oil. The end product we have in mind is biodiesel to be added to fossil diesel," he explained. (Agência CONTAG de Notícias, August 2006)

- The directors of CONTAG held a meeting with president Lula in 2007 and requested more attention from the government to the expansion of the sugar/alcohol industry and to its impacts on the lives of about 800,000 rural workers. The Confederation expects to ensure decent and appropriate living and working conditions to the detriment of the industry's expansion. A list of claims was submitted. *(Jornal da CONTAG,* September 2007)

- Antoninho Rovaris acknowledges the political importance of the auction system and of awarding the Social Fuel label, but he has doubts about the efficacy of the project for including family farmers in the biodiesel production chain that is being designed: "In principle, we see the political efforts being made by Secretaria de Agricultura Familiar do Ministério do Desenvolvimento Agrário - SAF (*Family Agriculture Secretariat of the Ministry of Agrarian Development*) as very positive. However, we don't see the government as a whole making the same efforts as SAF, and neither some units of the Ministry of Agrarian Development itself. We, the workers, are the ones who are actually trying to ensure the feasibility of practical requirements for including small farmers in the biodiesel chain."

- "So far, we have faced serious problems for including small farmers in the PRONAF, we still have to address the agricultural zoning issue, the debt of these farmers, and the difficulties they face to access credit. In addition, research has not kept up with current biodiesel production needs, i.e. we don't have certified seeds for virtually none of the oleaginous plants in higher demand. We know that the government is making a true political effort, but we don't see any practical effort being made to create minimal conditions to include family agriculture in the National Biodiesel Program," stressed Antoninho Rovaris. (*Carta Maior* news agency, October 2007)

2. Some NGOs

- **ActionAid (AA) Brazil:** "It is obvious that this boom in biofuel production will not take place without causing high social and environmental impacts. Among the most likely ones, special mention should be made of more land ownership and land use conflicts, deforestation and burning of large areas, and over-exploitation of labor in sugarcane plantations, which will enhance inequality and poverty in Brazil. Another major impact is related to a likely reduction in areas available for growing food crops. Small leaseholders, sharecroppers and partners who grow subsistence food crops in areas inside land owned by large farmers will be the first ones to be affected. Biofuels can offer an economic opportunity to Brazil, provided that measures are taken to strengthen regulation and control mechanisms and to clearly define areas where expansion is possible, how this activity should be expanded and what mitigating measures should be taken based on a sound ecological and economic zoning. Actions should be taken to develop 'alternative models' for producing biofuels which are not based on monoculture schemes, but rather on the combination of different crops, on agroforestry systems and on agroecological principles. Family agriculture should be involved in the sustainable production of biofuels as an alternative for generating jobs and income, and mainly for effectively protecting family agriculture, traditional communities, "quilombolas" (descendents of runaway slaves), riverine populations and indigenous people, against the non-sustainable expansion of the biofuel agribusiness. It is also necessary to establish an inspection system to prevent the historical super-exploitation of labor in crops." *(Celso Marcatto, Food Security coordinator.)*

- **AA Americas:** "The Brazilian Government seems to be prepared to make concessions at the WTO, reducing import taxes applied to industrial products and services imported from the US and Europe to appease the appetite of multinational agribusiness. (...) If the government continues to support this position, it runs the risk of jeopardizing its objectives of consolidating regional integration and placing poverty reduction at the top of its agenda, as announced at the MERCOSUR summit in Rio de Janeiro early in 2007." *(Adriano Campolina, director.)*

- **AA International:** "We need to ensure the sustainable generation and rational use of bioenergy as a contribution to implementing the Rio Declaration and Agenda 21, as well as all conventions on climate change, biodiversity, desertification and other international energy-related agreements. (...) We believe that biofuels should not be automatically classified as 'renewable energy', only those from a sustainable source. Implementing a compulsory certification system before further expanding the biofuel market or before converting large tracts of land is a fundamental measure." *(Francisco Sarmento)*

- **WWF/Brasil:** "Economic tools are also required to encourage sustainable agricultural practices. Governments can and should do this," said Kuglianskas (*Valor Econômico* newspaper, 05/18/07).

- **Comissão Pastoral da Terra – CPT (*Land Pastoral Commission*)/Northeast Regional Office, and Rede Social de Justiça e Direitos Humanos (*Justice and Human Rights Social Network*):** "Experiences such as small farmers growing castor bean in the northeast region showed the risk involved in depending on large agricultural companies, which control production prices, processing and distribution. Peasants are used to lend legitimacy to agribusiness through the award of the 'social fuel' label. An expanded biofuel production threatens food sovereignty and can deeply aggravate the hunger problem in the world. This model causes negative impacts on peasant, riverine, indigenous and *quilombola* (descendants of runaway slaves) communities, whose territories are threatened by the constant expansion of capital. The agricultural model should be based on agroecological and production diversification principles. Peasant agriculture experiences, based on the diversity of ecosystems, should be recovered and replicated. There are multiple traditional production technologies and knowledge systems, such as integrated and lasting agroforests and combined agriculture/livestock systems. There are also local technologies and knowledge systems for collecting, storing, managing and using water for consumption and production purposes which preserve natural sources." (*O mito dos biocombustíveis* (the biofuel myth), 03/05/07, MST website).

3. FAO/UN/ECLAC

- **FAO (CFS:2007/2):** "Bioenergy offers both opportunities and risks for food security. The impacts will vary over space and time depending on the evolution of market forces and technological developments, both of which will be influenced by policy choices at national and international levels (related to the environment, agriculture, energy, and trade). It is necessary to develop an analytical framework that takes into consideration the diversity of situations and specific needs of countries."

- **FAO/ECLAC:** "Latin America and the Caribbean, but particularly some South Cone countries, are provided with very favorable conditions for producing biofuels now and expanding this production in the future. An expanded bioenergy industry could affect the food security of families and countries in each of its four dimensions (availability, access, stability and use), of which access is a key factor in Latin America and the Caribbean. The impact of liquid biofuels on the prices of food products and animal feed would be a short-term impact until a new balance is reached between supply and demand. The figures for Latin America and the Caribbean show that there is a huge potential for expanding new crops. Part of the available arable land could be used to grow energy crops, which if accompanied by a package of well-designed policies and programs could favor millions of small farmers who are facing poverty conditions, without jeopardizing forests or food security in the region. If second-generation technologies based on lignocellulose raw materials become feasible from a marketing point of view, the competition for land and other agricultural resources could decrease. Small-scale biodiesel systems could even improve soil fertility if the oil seed species used for producing energy were grown in combination with food crops." (Working paper: *Oportunidades e riscos do uso da bioenergia para a segurança alimentar para a América latina e o Caribe.[*Opportunities and risks of using bioenergy for food security purposes in Latin America and the Caribbean])

4. MDA/SAF

- Edna Carmélio, Biofuel Coordinator of the MDA, says that "ethanol production concentrates the income: as for biodiesel, even if its production is not exclusively reserved for family agriculture, it has a strong social component."

- The MDA (2007) adopted a series of guidelines and measures to foster the inclusion of family agriculture in this production chain:

• It mobilized the main organizations representing family agriculture and rural social movements around the topic. As a result, for example, CONTAG linked up all its state and municipal system to take part in negotiations held between farmers and companies to monitor local actions.

• It created the PRONAF Biodiesel program, through which family farmers can access additional credit/defrayal of costs for planting oil seeds before paying off a previous debt. Farmers can now continue to plant their corn, beans and also oil seeds used in the production of biodiesel.

• It amended a PRONAF resolution to make it possible for family farmers entitled to microcredit (referred to as B farmers, most of whom live in the northeast region) to access credit to grow castor, which was not allowed before (they could only use credit for investment and castor bean falls under the defrayal category).

• It amended the harvest insurance resolution to give priority to family farmers living in semi-arid areas of the northeast region who grow beans in combination with castor bean. If they lose their harvest, they are entitled to get the benefit before others. Since castor bean is a drought-resistant species, even if they lose their bean harvest they still have a productive activity to ensure their income.

• It negotiated an assistance scheme with Banco do Brasil, BNB e BASA for meeting demands for PRONAF credit for defraying costs and investing in oil seeds for producing biodiesel.

• It raised over R$ 5 million in projects for setting up raw-material producing centers for the biodiesel industry, and to improve and make new agricultural technologies and low-scale biodiesel technologies available to family farmers.

- "I believe that biofuel production and food crops are compatible with each other if they are carefully planned and regulated for the purpose of, for example, avoiding the purchase of land by foreign investors, which involves a national sovereignty problem," the minister of Agrarian Development, Guilherme Cassel, said in a conversation with IPS (06/14/07).

- "Reproducing models adopted in past centuries (which historically concentrated the income and generated social inequalities and environmental destruction) in the beginning of the 21st century would not make any sense and would boil down to reproducing inadequate past conditions," summarized Rossetto, former minister of Agrarian Development, in a discussion on Ethanol and Biodiesel in Family Agriculture with Ildo Sauer, director of the Gas and Energy units of PETROBRAS, and Marcelo Guimarães de Mello, a UNDP consultant (Porto Alegre, 06/22/07).

5. MME

- "The inclusion of schemes for growing oil seeds, sugarcane or another energy crop should be part of the whole. If farmers cannot deliver the raw material, they keep the pie, or the crushing residue, to feed livestock and use it as organic fertilizer in food crops. This way, they reduce their production costs and dependence on chemical fertilizers, increasing food production. This is how energy crops can potentialize and reduce the costs for growing food crops. Growing only energy crops is not a sustainable activity for small farmers for this reason. The law must be improved and the State should take a more active part in the process." (*Biocombustíveis: a hora e a vez do Brasil* [biofuels: a favorable moment for Brazil], João Ramis.)

- "Given its strategic condition for Brazil, it is imperative to consider the possibility of setting up a national secretariat to deal with biomass-related issues in an integrated fashion, so that a bioenergy production policy may be closely linked to food production. For this purpose, it should be linked to the Presidential Staff Office, so that it is powerful enough to coordinate the actions of all the ministries and institutions involved." (*Biocombustíveis: a hora e a vez do Brasil* [biofuels: a favorable moment for Brazil], João Ramis.)

- "We need to prepare PETROBRAS for the future immediately as a company which produces liquid renewable energy - biofuels - and as a company which transmits and generates electricity from renewable sources (water, eolic, solar, biomass, etc.)." (*Biocombustíveis: a hora e a vez do Brasil* [biofuels: a favorable moment for Brazil], João Ramis.)

- The federal government launched, in 2004, the Programa Nacional de Universalização do Acesso e Uso da Energia Elétrica – Luz para Todos (*National Program for Ensuring Universal Access to Electricity and its Use*) for the purpose of making electricity available to the populations of rural areas. In their majority, families without access to electricity live in villages with a lower Human Development Index (HDI) and are low-income families. About 90% of them earn less than the three minimum wages a month and 80% of them live in rural areas. The program was designed to make electricity available to these communities, to that they can use it as a social and economic development vector, contributing to reduce poverty and increase family income. Consumers with no electricity at home just have to go to the local distributing company and apply for a connection. These applications are contemplated in the civil construction projects of distributing companies and they are met according to the priorities set in the program's operationalization manual and by its Comitê Gestor Estadual – CGE (*State Managing Committee*). The program was designed to meet electricity demand in rural areas through one of the three following alternatives: network extension, decentralized generation systems with isolated networks, and individual generation systems (MME website). For this purpose, some options are available for isolated communities, such as producing biodiesel through a cracking process developed by the Universidade de Brasília – UnB (*University of Brasília*) (see item 7 - EMBRAPA).

6. PETROBRAS

- **Plants in the Northeast region**: "It is not by chance that plants located in the states of Minas Gerais, Ceará and Bahia will rely on a special policy designed to increase the competitiveness of family agriculture suppliers," explained Gabrielli, president of PETROBRAS: "Vegetal oil is a world oligopoly and family agriculture will need to be competitive in relation to agroindustry." (*Valor Econômico* newspaper, 05/18/2007).

- **MDA's opinion**: PETROBRAS is playing a key role in structuring the biodiesel chain. First, because it is virtually the only purchaser of the biodiesel being sold through auctions. So far, PETROBRAS purchases of biodiesel amount to approximately R$ 1.26 billion (781 million liters). Second, because it set up 2,278 gas stations supplying biodiesel in the country, in response to the need to organize the distribution of B2. Third, because it adopted the strategy of being a biodiesel producer as well. PETROBRAS will be inaugurating three biodiesel factories in December 2007: in Quixadá (state of Ceará), Candeias (state of Bahia) and Montes Claros (state of Minas Gerais). Biodiesel will be produced with family agriculture. These three factories are expected to ensure the social inclusion of about 75,000 families.

- **Strategy:** With the aim of keeping up with changes in the global energy matrix, PETROBRAS adopted the strategy of focusing its investments on ethanol, biodiesel and H-Bio and it has plans to migrate from a petroleum company to a large energy enterprise. The objective of the company is to "be a leader in the petroleum, natural gas, oil by-product and biofuel market in Latin America," said the general manager for Clear Products of PETROBRAS, Edgard Manta.

7. Empresa Brasileira de Pesquisa Agropecuária — EMBRAPA (*Brazilian Agriculture/Livestock Research Company*)

- **The EMBRAPA** is a state enterprise, linked to the MAPA, which was set up on April 26, 1973. Its mission is to "ensure the feasibility of solutions to promote sustainable development in rural areas with a focus on agribusiness by generating, adapting and transferring knowledge and technologies, for the benefit of the different segments of Brazilian society." EMBRAPA operates through 38 research centers, three service centers and eleven central units and it is present in almost all Brazilian states. It has a staff of 8,619 employees, 2,221 of whom are researchers, 45% have a master's degree and 53% have a doctor's degree and its budget was more than R$ 1 billion in 2007. The EMBRAPA Agroenergy Department has the specific mission of "ensuring the feasibility of innovative technological solutions to promote the sustainable and equitable development of the agroenergy business in Brazil for the benefit of society." (MDA website)

- **Palm family:** "Palm species and other semiperennial or perennial species can increase productivity from 3,000 to 4,000 liters per hectare," according to the director-general of EMBRAPA Agroenergy, Frederico Durães. Brazil already masters the technology for producing biodiesel from palm species. "What we need is to expand our innovating capacity to work with this species and scale it up to a commercial level from the energy point of view," Durães stressed. In the medium term, EMBRAPA is mainly betting on African palm oil (Elaeis guineensis). (*Agência Brasil* news agency, 05/22/2007).

- **Partnerships**: EMBRAPA and PETROBRAS are developing partnerships around agroenergy to solve issues related to the production of vegetal oils, agroclimatic zoning and development of co-products from residue such as castor bean cake, glycerol and sugarcane bagasse. The strategy will foster EMBRAPA's competency in tropical agriculture and PETROBRAS's capacity to produce and distribute energy, enhancing the competitiveness of Brazil's agroenergy industry. Some outcomes are palpable already, such as the evaluation and recommendation of promising oil seeds according to the features of each region and genetic improvements in sugarcane. They were produced by units such as the EMBRAPA Soja (soybean), EMBRAPA Algodão

(cotton) and EMBRAPA Tabuleiros Costeiros in association with universities and different partners (EMBRAPA Agroindústra de Alimentos, 05/22/07).

- **Cracking:** this is an alternative to the "transesterification" of vegetal oils and animal fat for small and medium biodiesel producers, particularly for community consumption or supply. The UnB and EMBRAPA developed it. The commercial prototype of this equipment is being developed in partnership with the company Global Energy and Telecommunication (GET), relying on the support from Financiadora de Estudos e Projetos – FINEP (*Studies and Projects Financing Agency*). Vegetal oil is placed in a stainless steel cracker and subjected to high temperatures with or without catalyzers. In the cracker, atomic links are broken, particularly the most sensitive ones. The current prototype contemplates four stages for collecting distilled fractions with features similar to those of fossil diesel, gasoline, kerosene and liquefied petroleum gas. The main advantages of cracking are that no glycerol is produced as a sub-product, no alcohol is used in the process, the initial fixed investment cost is lower and it is relatively easy to operate, making the process particularly adaptable for producing biodiesel at small and medium scales. The first prototypes developed under the partnership with GET are being designed to meet the needs of farmers or cooperatives of small farmers in remote regions, making them self-sufficient in terms of energy. The equipment also allows for micro and small companies or even cooperatives of farmers devoted to producing biofuel to be set up, improving the exploitation conditions of small and medium-sized properties through a technology that adds value to the agricultural product. Soybeans, sunflower, canola, castor bean and palm oil were the researched raw materials (Gazzoni D. and Felici P., BiodieselBr.com, 08/03/06). However, the results presented by the UnB at an Agroenergy event held at EMBRAPA, in April 2007, on the topic *Technological routes for biofuel production* seemed somewhat preliminary, as although they were consistent with most specifications for diesel from petroleum, the acidity of all samples which were presented at the event was much below the minimum levels demanded by the market, namely, 0.8 mg KOH/g, as usually determined in international biofuel specifications (Campos L., BiodieselBr.com, 04/18/07).

8. Industry without the label

- **Influence of ANP:** Industries that were not awarded a label cannot take part in auctions held by ANP. Apart from not being allowed to trade biodiesel up till 2008, the partial or full tax exemption granted to companies linked to Family Agriculture, that is, the label, reduced prices, mainly in the northeast, north and semiarid regions, and made it possible for industries operating in the northeast region to participate more. Finally, "industries must bet on an exchange rate based on an international price forecast and engage in financial negotiations to ensure the same profitability as that of oil with the sale of biodiesel," said César Borges de Sousa, vice president of Associação Brasileira das Indústrias de Óleos Vegetais – ABIOVE *(Brazilian Association of Vegetable Oil Industries)*.

- **Influence of the label:** According to analysts of the sector, being awarded the label can be a problem for large plants (which produce more than fifty million liters a year). The higher the biodiesel production, the higher the need to have a long-term, consistent and comprehensive project involving a large number of family farmers supplying raw materials. On the other hand, it is essential to establish clear and straightforward laws that do not favor certain industries as a result of the misinterpretation of tax laws.

9. Industry with the label

- **End of auctions:** The president of União Brasileira de Biodiesel – UBRABIO (*Brazilian Biodiesel Union*), Odacir Klein, and its director and executive secretary, Sérgio Beltrão and Donizete Tokarski, respectively, emphasized the importance of continuing to hold ANP auctions. "The end of the auctions right now would jeopardize the efforts of companies to be awarded the Social Fuel label and the momentum for setting up biodiesel-producing industries," he said. (MDA, 06/18/07)

- **The case of the Brasil Ecodiesel (BED) company:** The rise observed in the prices of soybean oil in the first quarter of this year strongly contributed to make the gross profits of BED fall from 9.9% to 7.3% during the period. This scenario, added to logistical problems for delivering biodiesel to PETROBRAS, led the company to close the first quarter of this year with net damages amounting to R$ 526,000. Another problem faced by BED in the quarter was the lack of synchronism between a higher production and the logistics used by PETROBRAS to remove the product. In operation since late 2005, BED has only been using soybean oil to produce biodiesel. Based on a partnership with family farmers, the company will manage to reduce the participation of soybean oil to 70% this year. Castor bean and sunflower oil will account for respectively 12% and 18% of all the raw material. By 2010, the soybean by-product will be reduced to 20% and the rest will be distributed between castor bean and sunflower. In that year, the company will begin to crush pine trees (Jatropha curcas) that it began to plant experimentally on 26,000 hectares in the states of Ceará and Piauí (*Gazeta Mercantil newspaper*, 05/14/07). BED expects to increase its profit margin by at least 15% by replacing soybean with other oil seeds for producing biodiesel (*Gazeta Mercantil newspaper*, 03/07/07).

10. The Instituto de Estudos do Comércio e Negociações Internacionais — ICONE (*Institute for International Trade Negotiations*)

Marcos Jank, the former president of the institute, denied recent controversies around agrofuels:

- The increase observed in the prices of related products, such as in those of the Mexican *tortillas* or meat, could be controlled by a more competitive ethanol production (through biomass hydrolysis, for example) and lead to bilateral cooperation in the area of research and technology; or by reducing the import tariff or expanding its quota.

- The target of the US to replace 15% of the gasoline being used now by alternative and renewable fuels would involve three times the area currently occupied by sugarcane plantations plus 7% of the total arable area available in Brazil, without considering bagasse hydrolysis and new sugarcane varieties. Soybeans, corn, cotton and sugarcane would engage in a competition for land use based on their relative prices, logistical conditions and crop rotation. According to him, the unavoidable intensification of meat and milk production will be the corollary of the process.

- The expansion of commodities (agricultural, mineral and now agro-energy commodities) will not lead to an appreciated exchange rate and to Brazil's deindustrialization. Less efficient sectors of the Brazilian industry would be deeply affected by the lack of solid institutions and reforms in public policies. In addition, there would be no controversy between "agribusiness and family agriculture." (*O Estado de São Paulo* newspaper, 03/21/07)

11. Farmers engaged in agribusiness

The saga of farmers in the south region (buying cheap land in the mid-west region to expand grain crops) has been temporarily interrupted. High production costs, particularly freight costs, reduced the profitability of crops in the region. On the other hand, the positive results achieved in the south region led these farmers to focus their investments on farms located in traditional grain-producing regions, such as in the north region of the state of Paraná. "With the dollar below R$ 2.30, it is unfeasible to grow crops in the mid-west region," said a farmer, stressing that the lack of infrastructure can be clearly felt now. According to his calculations, the profitability of soybeans in the state of Tocantins in the last harvest, including freight expenses, amounted to about 5% of the product price, which was never so high in US dollars as now. In the region of Maringá, this rate rose to 15%. (*O Estado de São Paulo* newspaper, 05/20/07).

12. The biodiesel industry

- Arable land is abundant in Brazil. It is in great supply, with a good topography for growing crops. There is also enough money to invest in new plants, with BNDES being the main funding source. But this is not enough. For the sugar-alcohol industry in Brazil to keep growing at the current pace and to take part in the biodiesel production chain on a sustainable basis, much more is necessary, according to entrepreneurs and experts of the sector (*Valor Econômico* newspaper, 05/18/07). Brazil's main weakness is that more entrepreneurship is required in the country. Starting a new business is difficult. (Ian Bremmer, *Época* magazine, 05/22/07)

- The main criticism of the biodiesel industry against the PNPB is related to the taxes applied to the production and marketing of the product, which are comparatively higher than in Europe, and to its raw materials. In relation to marketing, companies are exempted from paying the Imposto sobre Circulação de Mercadorias e Prestação de Serviços – ICMS (*Tax on Circulation of Goods and Services*) or are granted a reduction in this tax if the states adhere to or apply agreements n. 11/05 and 113/06. As for production, entrepreneurs believe that the tax system should benefit the whole chain, regardless of the percentage of raw materials contemplated in the special regime provided for in law n. 11,116/2005. The compulsory payment of the ICMS on anhydrous alcohol bought for producing biodiesel is another problem.

- The UBRABIO represents 25 companies currently, including biodiesel producers and suppliers of equipment and raw materials. This organization is expected to be officially established early in July. There are about 55 companies operating in this industry in Brazil right now. They have more than seventy biodiesel-producing plants, most of which are waiting for ANP to authorize them to begin to operate. The president of UBRABIO, Odacir Klein, emphasized during a meeting in Brasília that the purpose of this organization is to work in tune with the Ministry of Agrarian Development. (MDA, 06/18/07)

13. Décio Luiz Gazzoni (EMBRAPA researcher)

As an example of the potential impact of an imbalance between supply and demand, Gazzoni mentioned the main threat posed by a high consumption of soybeans for energy-

producing purposes: the non-delivery of biodiesel produced by industries hired by PETROBRAS through public auctions. If this happens, the government may not be able to achieve the official target of adding biodiesel to the diesel oil consumed in the country at a percentage of 2%, leading to the failure of the PNPB. As a means to minimize the potential impacts of such a distortion, the researcher suggested that the biodiesel market should be regulated in international forums such as FAO, UNCTAD and the WTO. According to Gazzoni, a measure of this kind would ensure a safe supply if alternative raw materials for manufacturing biodiesel are sought in combination with it. (*Jornal do Brasil* newspaper, 06/04/07)

14. M.S. Swaminatham

This Indian agronomist, who is the founder and president of the Swaminathan Research Foundation, is a supporter of the *evergreen revolution*, the second generation of the green revolution, which goes beyond the first one (which is essentially production-oriented) and proposes an agricultural model focused on ensuring a fair (economically feasible) income in harmony with nature (environmentally correct), particularly to small farmers, the so-called family farmers. (*Biocombustíveis: a hora e a vez do Brasil* [biofuels: a favorable moment for Brazil], João Ramis.)

15. Griffon

Agronomists fear that demand for land may increase beyond control as a result of the "four Fs": *food* (for humans), *feed* (for animals), *fiber* (textiles) and *fuel*. Although agrofuels account for less than 1% of the energy produced throughout the world, its influence on the prices of agricultural raw materials can be clearly felt already. Many countries established daring development objectives for coming years. "We would need to have two planets to fill our stomachs and tanks and ensure the future of biodiversity," summarizes Michel Griffon. (*Le Monde, 05/14/07*)

16. José Walter Bautista Vidal

This physicist is regarded as the "father" of the PROÁLCOOL program. According to him, "in order not to miss the opportunity of being the star of the energy revolution, we obviously need to control fuel distribution systems. This is how things always work. In Brazil, five multinational companies control the soybean market, because they control the distribution system. The situation is the same in the dairy market. But now we are talking about fuels, which belong to a strategic industry that can be the engine of deep social changes. This has nothing to do with ideology; it's pragmatism. The government needs to invest heavily in infrastructure now; it must have a project for Brazil. Technology must be constantly evolving and only private companies have been ensuring this evolution. The pioneers of studies on ethanol, the researchers who developed the technologies being used in Brazil are all getting old. But president Lula only invited me to have a conversation on this matter two months ago!" (*O Estado de São Paulo* newspaper, 06/24/07)

17. Ignacy Sachs

Honorary professor of the School for Highlevel Social Sciences of Paris and co-director of the Contemporary Brazil Research Center. He prefers not to refer to agrofuels as a "market," which is opening itself up towards a commodity and that is produced under a monoculture regime essentially focused on ensuring the economic efficiency of the process, but rather as a production system within a broader vision, which he refers to as the "modern biomass civilization."

- From now on, biotechnologies will be required to play a larger and increasingly important role in this new cycle of civilization.

- Seed production has become strategically important, and Brazilian research institutions such as EMBRAPA have a key role to play in the country in this connection. Brazil should fully realize its natural comparative advantage for producing biomass with comparative advantages built through research, as was in the case of ethanol from sugarcane. The establishment of an agroenergy center at EMBRAPA is a positive development, but the resources earmarked for it so far leave much to be desired in relation to the magnitude and urgency of the undertaking.

- This civilization will have the task of producing not only agrofuels, but also food products for humankind, feed for animals, green fertilizers, industrial raw materials (such as fibers and plastic), pharmaceutical products, cosmetics, etc.

- "The biomass civilization will make it possible to address one of main problems of this century, the greatest and most difficult social problem par excellence: the problem of fighting hunger, generating jobs, ensuring decent work for all and, as part of it, ensuring a better future for the over two billion small farmers and their families throughout the world (in Brazil, there are more than 4.2 million of them)." (*Biocombustíveis: a hora e a vez do Brasil* [biofuels: a favorable moment for Brazil], João Ramis.)

- For managing the bioenergy boom that Brazil will experience over the next decades, the following measures seem timely:

• A specific regulatory agency should be set up to intervene in negotiations with foreign investors and assess bioenergy projects from a social, environmental and economic perspective and not only based on conventional cost/benefit analyses and on the lowest cost. This agency should also encourage programs designed to include bioenergy in territorial development strategies at the municipal or sub-regional level based on an ecological-economic zoning and emphasizing food and energy integrated systems.

• Existing tools for ensuring preferential treatment to family farmers should be improved, such as the social label (which is not applied to ethanol from sugarcane), PRONAF credits, and contracts between large companies and smaller biomass suppliers. They should also be more transparent and more strictly controlled by social organizations. Labor and social policies should also be developed for temporary rural workers and sugarcane cutters.

• Bioenergy provides a great opportunity for promoting the establishment of cooperatives, fair trade between farmer and consumer cooperatives, and other collective undertakings.

- As agrofuel exports grow in importance, two measures will be necessary: (i) certification to make sure that agrofuels comply with ecological and social rules, so as to prevent any boycott imposed by consuming countries; (ii) policies specifically designed to avoid the "Dutch disease," caused by an excessive exchange rate appreciation.

■ Quotation (2001): The greatest opportunity for generating additional jobs in rural areas lies in promoting new uses for biomass, initially exploring its potential as a bioenergy source.

Considerations on some of the topics under discussion

As mentioned in the previous section, multiple and complex topics are being discussed and the positions assumed in relation to them vary remarkably. Some of the issues addressed in most of these discussions will be listed below. Involving from very negative to extremely positive evaluations, they include arguments and organizations which are more radically against any proposals related to agrofuels; the vision of agrofuels as a modest component of a broader energy and environmental policy; support to second-generation agrofuels only, made from cellulose raw materials; agrofuels challenged from an environmental perspective; discussions on the impacts of bioenergy policies on food security and sovereignty; discussions focused on the beneficiaries of these policies - agribusiness or family agriculture; discussions on ethanol/private sector/agribusiness X biodiesel/public sector/family agriculture; and, finally, a set of discussions aimed at reinforcing the integration of family agriculture and the sustainability of these policies.

Naturally, many of the issues at stake do not follow the logic sequence of the topics being proposed here and involve all the positions adopted so far. However, we hope that these distinctions will allow us to separate the weight and implications of different arguments with the aim of furthering the discussions under way and taking appropriate positions.

A special issue of the *Seedling* magazine (July 2007), which is published by GRAIN, accurately summarizes the arguments that are leading a group of organizations and academics to toughen their opposition to the biofuel option - an opposition which is also present in their discourse, as evinced by the use of the word "agrofuels" as opposed to biofuels, as was decided in discussions held at the World Social Forum in Mali. The biofuel strategy is therefore seen as a continuation and acceleration of the agroindustrial model under the control of agribusiness transnationals operating in an increasingly integrated fashion with oil companies and car manufacturers. Under this model, a huge number of peasants and family farmers and of rain forest areas will be displaced as crops grown in monoculture schemes rely on the labor provided by unprotected rural workers, reproducing colonial scenarios. Many social organizations and movements, such as the World Rainforest Movement and the MST, as well as academics, particularly those who support agroecological proposals, like Altieri (2007), assumed a position marked by a clear and comprehensive opposition.

The fundamental argument is that the industrial model of agriculture is, more than any factor, to be blamed for causing global warming. Agriculture and transportation account for 14% of all emissions each, while the expansion of agriculture at the expense of forests accounts for 18% of them. In a country like Brazil, it is estimated that 80% of all emissions are caused by deforestation. Second-generation agrofuels, which are produced from the enzymatic processing of cellulose, are seen with even more distrust, as they will surely require monoculture schemes in forest areas and reduce soil fertility due to the use of waste, leading to the need to make more intensive use of chemical fertilizers. Producing agroenergy from cellulose is also seen as a path

that will increase our dependence on state-of-the-art biotechnology in the form of patented products and processes. This type of agriculture fundamentally depends on irrigation at a moment in which lack of water is a threat as dramatic as energy and global warming. In terms of energy, data provided by FAO indicate that a five-fold more intensive use of commercial energy will be required for farmers in industrialized countries to grow one kilo of grains in relation to farmers in Africa, a difference which increases 33 times in a comparison between the production of one kilo of corn in the US and in Mexico.

Some consultants specializing in oil seeds, such as John C. Baize (2006), are so skeptical in relation to the trends observed in the area of agrofuels that they fall under this first category of strong opposition. Considering, however, that their opposition is not based on principles, but rather on a comprehensive questioning of feasibility arguments, they provide a bridge to those who emphasize the modest role played by agrofuels in relation to both energy challenges and carbon emissions.

Baize challenges forecasts made for petroleum, arguing that the hike in petroleum prices was caused by the effects of Katrina and Rita in the Gulf of Mexico and by political uncertainties in the Middle East, and not to any exhaustion forecasts. If the oil price drops to about US$ 50/ barrel, most agrofuels would become unfeasible, as happened in the 1980s. According to this consultant, investments in the sector are inconsistent with the supply of raw materials[4] and will lead to a crisis with knock-on effects for commodities such as a grains, oil seeds and animal feed.

Other authors emphasize the extremely modest results of agrofuels from both the energy and the carbon emission point of view. Summarizing the results of two surveys carried out in the United States recently, Brian Tokar (2007) concludes that a whole harvest of soybeans and corn in the US corresponds to only 5.3% of all fuel needs, net of the energy spent for producing these commodities. According to the same author, the main problem in developing countries in relation to carbon emissions is caused by the loss of carbon dioxide captured in forests when they are deforested, and they are being deforested at a faster pace now to clear areas for growing soybeans, sugarcane, palm oil and other crops. Tokar accurately summarizes the conclusion of this kind of analysis:

> *Biofuels may still prove advantageous in some local applications, such as farmers using crop wastes to fuel their farms, and running cars from waste oil that is otherwise thrown away by restaurants. But as a solution to long-term energy needs on a national or international scale, the costs appear to far outweigh the benefits* (Tokar, 2007)

In the light of these considerations, various analysts and organizations are emphasizing what is being referred to as second-generation agrofuels, which will become available after the feasibility of using cellulose material is ensured. According to a memorandum of a meeting of Brazilian NGOs that was held to produce inputs for the meeting held Bonn in October 2006,

> *To avert the potential socio-environmental impacts of biofuels, a number of criteria were introduced and discussed by participating organizations. Aside from the generality positive response to the transition to renewable fuels, it is generally considered of great*

[4] For details on the companies, amounts and installed or projected capacities, also see *Corporate power agrofuels and the expansion of agribusiness*, Seddling, 2007.

importance to promote adequate investment in the so-called "second generation" of biofuels, based on cellulose raw materials. These are likely to reduce additional pressures on land and related natural resources, since they permit the use of agricultural residues and biomass rather than require further crop expansion. (Friends of the Earth - Brazilian Amazon Land, 2006)

Similarly, the FAO/ECLAC (2007) document also stresses the favorable consequences of producing agrofuels from cellulose material: "If second-generation technologies based on lignocellulose raw materials become commercially feasible, competition for land and other agricultural resources could decrease." (ECLAC/FAO, 2007)

Against this position, an agroecologist would point out the negative impact of using waste, which would jeopardize the restitution of soil nutrients and would increase the demand for chemical fertilizers. It is also estimated that the logistical costs for "harvesting" this material would be prohibitive. In the form of planted forests, the scheme would boil down to the monoculture model already adopted by the cellulose industry.

In relation to this criticism, the GRAIN report (Seedlings, 2007) draws our attention to the control applied by transnational companies to research aimed at ensuring the feasibility of cellulose material, whose path involves enzymatic advances supported by genetic engineering.

Differently from the situation today, this second generation will be marked by technologies protected by patents, which would ensure greater strategic control over the evolution of the market to transnational companies. By the way, this logic will also be applied to crops usually grown to produce agrofuels, where the same companies are developing sugarcane, soybean or corn varieties that will be equally protected by patents under strategies increasingly focused on integrated projects for processing and producing raw materials.

In January 2007, an open letter (signed by 224 institutions, 23 individuals linked to institutions and 94 people without any institutional links) asked the European Union to give up the targets it set for agrofuels (www.biofuelwatch.org.uk). This opposition was triggered by a negative evaluation of the impact of demand for biodiesel in rain forests, particularly in Malaysia and Indonesia. The letter begins as follows:

We are extremely concerned by the plans as presented by the European Commission to adopt mandatory target for biofuel use in transport. Implementing these measures means that the EU will risk breaching its international commitments to reduce greenhouse gas

Companies which develop cellulose enzymes for agrofuels and their corporate partners

Diversa/Celunol	Syngenta, Dupont/Tate&Lyle, Khosla Ventures
Iogen	Shell, Goldman Sachs
Genecor (Danisco)	Tembec, mascoma/Kohsla ventures, Cargill, Dow, Royal Nedalco
Novozymes	DuPont, Broin, COFCO, China Resources Alcohol Corporation
Dyadic	Abengoa, Royal Nedalco

Source: Seedling, July 2007

emissions and protect biodiversity and human rights; because, as set out below, the proposed target will among other things promote crops with poor greenhouse gas balances, trigger deforestation and loss of biodiversity and exacerbate local land conflicts.

In June 2007, after the European Council decided, in March, to set a 10% target for agrofuels by 2020, thirty international organizations began to pressure for a moratorium. It was estimated that this target would require up to 50% of all arable land areas in Europe and therefore most raw materials would come from palm oil, soybean or sugarcane plantations in southern countries. They argued that these plantations have been growing, particularly in the southeast region of Asia, at the expense of deforestation and incorporation of swamp areas, which are true carbon storehouses. The scale of both individual operations (a Chinese project in the Philippines contemplates the incorporation of one million hectares) and of national programs (Indonesia has plans to increase its planted area of six million hectares today to 26 million hectares by 2025) suggests that deforestation in this region will hit the mark of 2.8 million hectares per year (www.enn.com/today).[5]

African countries are also seen as privileged partners in agrofuel production. It is estimated that fifteen African countries, which are referred to as the "green OPEC," have more land available than India. In those countries, large-scale projects are being implemented which involve thousands and thousands of hectares and millions and millions of dollars (GRAIN, 2007). According to the proponents, the projects will only come to ripeness, however, if "the current inefficient and low-intensity productive systems are replaced by better technologies and management systems by 2050" (Smeets, Faaij & Iewandoski, 2004).

The most controversial aspect of agrofuels is their impact on food and sovereignty security. A recent document prepared by ECLAC/FAO, summarizing a survey carried out on the situation in Latin America and the Caribbean, in relation to the four aspects of food security (availability, access, stability and use) and to its compatibility with an agrofuel program, supports the feasibility of agrofuels but with many conditioning factors and warnings. It argues that the availability of land is not the main problem:

"Considering areas with favorable edaphic-climatic and environmental conditions, appropriate production technologies and the necessary area for obtaining a 5% ethanol mixture (E5), we can see that the following countries have the highest potential for expanding their agricultural frontier based on sugarcane and corn: Brazil, Bolivia, Argentina, Colombia, Paraguay and Uruguay. In terms of biodiesel from soybeans or palm oil, the following countries have the highest potential: Brazil, Argentina, Peru, Colombia and Bolivia."

It is estimated that Central American countries, whose diet is based on corn, face availability risks[6]. In relation to access issues, the report mentions that extreme poverty and malnutrition rates have decreased in Latin America in recent years and highlights that "bioenergy programs could provide great opportunities if they were to be focused on small farmers." It emphasizes the Brazilian experience in producing biodiesel from castor bean, which is referred to as a great booster of local economies. At the same time, the report recognizes that impacts on the composition of productive systems can undermine the access or poorer segments of the population to food

[5] Demand for timber also increases the deforestation rate.

[6] Early in 2007, the price of *tortillas* in Mexico doubled as a result of a hike in the corn price in the United States caused by a higher demand for ethanol. Today, Mexico is largely dependant on corn imports from the United States. Because of these higher prices, grinders began to buy Mexican corn that was usually used to prepare *tortillas,* inflating its price.

in the short term. On the other hand, a possible general hike in the prices of these crops could end up transferring income to rural areas. Stability as a component of food security is described as the preservation of remunerative activities over time and on a sustainable basis. Given the different effects of hikes in petroleum prices, this stability depends "on the guidelines and design of policies applied to bioenergy programs in the region." Use, in turn, refers to the impacts of bioenergy programs particularly on water use and genetic resources that, together, "constitute the main requirement for preserving the lifestyle of indigenous populations in our region." The report concludes that the negative impacts on the prices of food products would be short-term impacts and that "energy crops, (...) if accompanied by a package of well-designed policies and programs, could benefit millions of small farmers who are living in poverty conditions now, without jeopardizing their forests or food security in the region."

The evaluation of consultant John Baize, discussed above, is quite different. In his opinion, the growth pace of bioenergy crops can lead to a conflict between demand from drivers in industrialized countries and poor consumers in developing countries. In the US, biodiesel production, mainly from soybeans, rose from 25 million gallons in 2004 to 180 million gallons in 2006. The annual installed capacity in 2006 amounted to 480.6 million, with 86 plants. This year, 35 plants were under construction or being expanded, creating an additional capacity of 559.1 million gallons. This is equivalent to 28% of all the demand for vegetal oil in the US. The consultant predicts that there will be a strong competition among crops (soybeans, wheat and corn, with a decrease in the capacity to export the latter). On the other hand, the price of bran will drop sharply, jeopardizing the relation between oil and bran in international markets. Both the US and Europe will become strongly dependant on imports, threatening the capacity of developing countries to continue to supply their domestic edible oil markets.

According to ECLAC/FAO, the imbalance in prices would be a short-term problem and the success of agrofuel programs would fundamentally depend on their capacity to design appropriate policies. On the other hand, investments under way, both in terms of the amounts involved and of the features of the respective investors, suggest that these policies could end up favoring interests that are not focused on ensuring food security or on promoting family agriculture as a privileged beneficiary of these programs.

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CHAPTER III

Challenges and prospects for agrofuels in Brazil:

family agriculture in relation to ethanol from sugarcane and biofuel from soybean, castor bean and palm oil[1]

Célio Bermann (coordinator), Luis Macedo Moreno, Mariana Soares Domingues and Renato Rosenberg

Fabrício Martins

ETHANOL FROM SUGARCANE IN BRAZIL

- Production distribution, productivity and prospects for future expansion
- Ethanol production, consumption and export in Brazil
- Main strategies of sugar/ethanol companies
- The sugar/ethanol industry and public authorities
- Participation of family agriculture in the production of the sugar/ethanol industry
- Labor relations in the sugar/ethanol industry production
- International ethanol scenario
- Main challenges

BIOFUEL FROM SOYBEAN, CASTOR BEAN AND PALM OIL

- Soybean crops in Brazil
- Castor bean crops in Brazil
- Palm oil plantations in Brazil

[1] This paper was written on July/2007.

Introduction

This document was prepared to be used as benchmark material in the debates held during the seminar *Agrofuels and Family and Peasant Agriculture*, which was held on July 12-13, 2007 in Rio de Janeiro.

The suggestions, questions, and contributions made during the debates were incorporated into the preliminary version presented at the seminar.

This document is divided into two parts. The first one evaluates ethanol from sugarcane produced in Brazil as an alternative fuel. The analysis was based on a survey and documentation of data and information related to the following aspects: production distribution, productivity, and prospects for the future expansion of sugarcane plantations in the country; ethanol production, consumption and export in Brazil; main strategies of sugar/ethanol companies for addressing technological and administrative issues; the sugar/ethanol industry and public authorities, taking into account public funding issues, environmental laws, infrastructure projects and certification; the participation of family agriculture in the sugar/ethanol industry production; labor relations in the sugar/ethanol industry production; and the international ethanol scenario, with particular attention to a recent agreement signed between Brazil and the United States. Finally, the main challenges facing the industry are presented, with the aim of providing inputs to the debates and identifying controversial issues being addressed by social and environmental movements with regard to the use of ethyl alcohol as an energy alternative.

The second part evaluates the main oil seeds that can be used as alternative raw materials for producing biodiesel, namely, soybeans, castor bean and palm oil. It presents a survey and documentation of data and information related to production distribution, productivity and prospects for future expansion, with particular emphasis on soybean crops. It also analyzes the main features of each of the raw materials considered here. In addition, it evaluates the main problems being faced for ensuring the effective inclusion of family agriculture in the biodiesel production chain.

We expect this document to contribute toward a broader debate on agrofuel production in Brazil, providing an information base and an analysis to be used as benchmark material by leaders of social movements, unions, non-governmental organizations, and environmental movements dealing with the energy issue and also by the general public interested in the renewable energy issue in the country.

1. Ethanol from sugarcane in Brazil

The Programa Nacional do Álcool – PROÁLCOOL *(National Alcohol Program)*, created in November 1975, provides the best example of the difficulties involved in implementing a fossil fuel substitution program under market mechanisms (which were allowed to operate after the first phase, during which governmental subsidies prevailed). It also provides the most evident example of how environmental benefits can be appropriated by certain parties to preserve privileges.

Launched in 1975, after the first world oil shock, the PRÓALCOOL program was gradually improved until it absorbed 8% of the country's planted area and generated over one million jobs, namely, 800,000 direct jobs and 250,000 indirect jobs (1991 data). According to data provided by FAO (2005), of the nineteen million hectares occupied by sugarcane plantations worldwide, 5.8 million are located in Brazil. Still according to 2005 data, 6.2 billion cubic meters of hydrated alcohol, a fuel made up of 96% ethanol and 4% water, are burned in Brazil every year. In addition, more than 7.8 billion cubic meters of anhydrous alcohol are added to gasoline at a 22-25% proportion (MME/EPE, 2006).

Table 1
Evolution of sugarcane production and yield in Brazil

Year	Production (million tons)	Planted area (million ha)	Productivity (t/ha)
1980	146.23	2.61	56.09
1990	262.60	4.29	61.49
1995	303.56	4.62	66.49
2000	325.33	4.82	67.51
2003	389.85	5.38	72.58
2006	457.98	7.04	74.05

Source: IBGE, 2007.

Table 1 shows the evolution of sugarcane production, planted area and productivity in Brazil between 1980 and 2006.

It should be highlighted that, in 2005, the world sugarcane production was 1,231,056 thousand tons, with an average productivity of 68.85 tons per hectare, while Brazil produced 422,926 thousand tons with an average yield of 72.99 tons per hectare (FAO, 2006).

In the past 25 years, a remarkable increase was registered in sugarcane production, which in 2006 was 213% higher than in 1980. In turn, the planted area increased by 170% during the same period. This difference was due to a significant increase of 32% in sugarcane productivity in the same period.

Preliminary data for the 2007-2008 harvest indicate that Brazil will produce 527.98 million tons of sugarcane, 87.4% in the center-south region and 12.6% in the north and northeast regions.

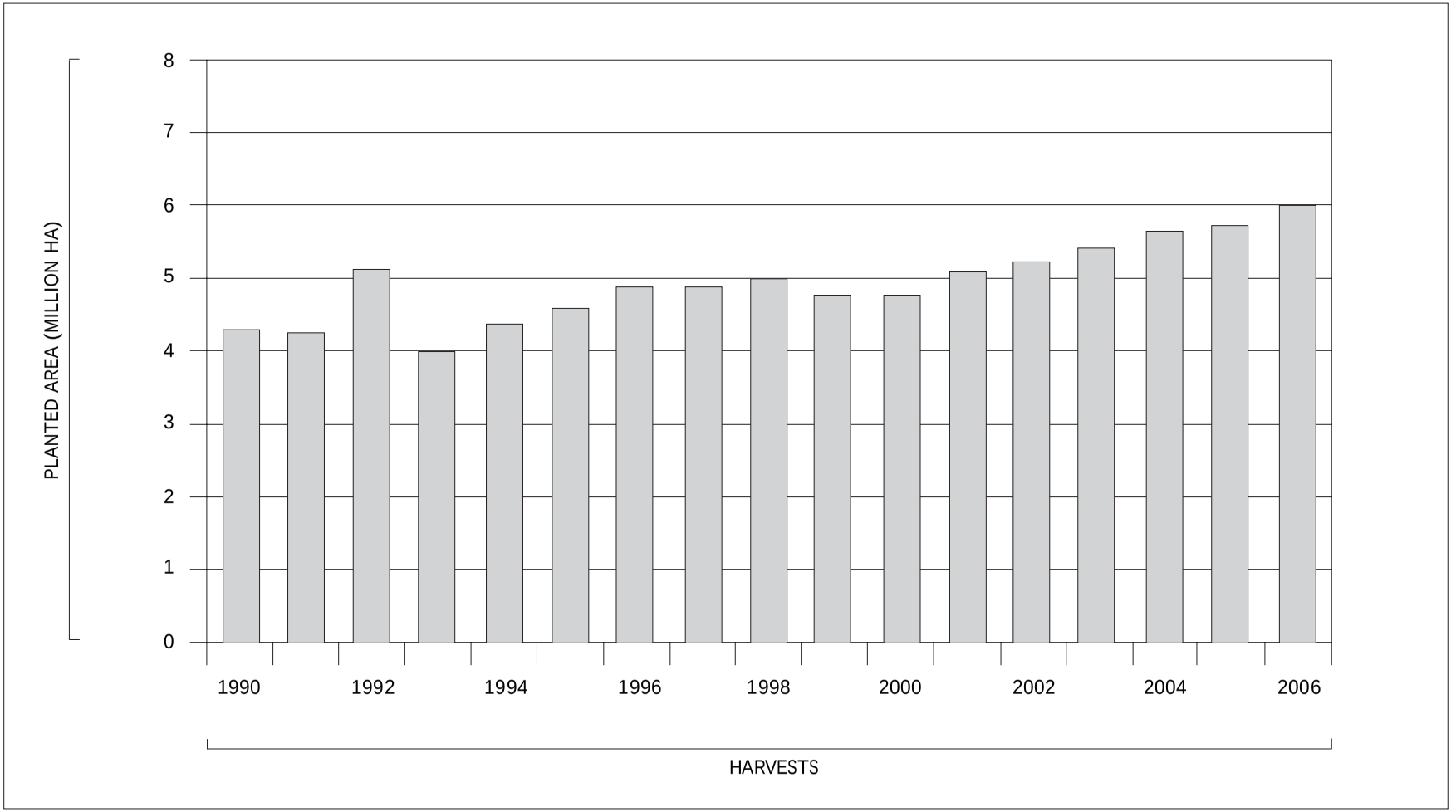
1.1. Production distribution, productivity and prospects for future expansion

Figure 1, on the following page, shows more detailed data on the expansion of the sugarcane planted area between 1990 and 2006.

The total planted area, which was 4.29 million hectares in 1990, increased to 7.04 million hectares in 2006. Considering data on the 2004-2005 harvest, as compared to the 2003/2004 harvest, the states of Espírito Santos, Minas Gerais and Mato Grosso do Sul incorporated new producing areas, increasing their harvested area in 2004 by 3.60%, 10.45% and 8.66%, respectively, in relation to 2003. In the northeast region, the largest sugarcane producers, the states of Pernambuco and Alagoas, achieved productivity gains. In the state of Pernambuco, production increased by 2.66% due to an increase in both harvested area (1.16%) and productivity (1.49%). In the state of Alagoas, productivity increased by 7.08%, and, despite a reduction of 2.79% in its harvested area, production increased by 4.09%. It should be highlighted that the state of Mato Grosso do Sul has been attracting businessmen of the sugar/ethanol industry, particularly from the northeast region, because lands are relatively cheap there.

As compared to data for the 2002-2003 to 2005-2006 harvests, it can also be noticed that there was an expansion of 14% in the average growth of the planted area in those regions. The mid-west region, which comprises the states of Goiás, Mato Grosso and Mato Grosso do Sul, was the one where the highest increase in planted area was observed (23%). The mid-south region, which in addition to the states of the mid-west region comprises the states of Espírito Santo, Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and São Paulo,

Figure 1
Evolution of the area planted with sugarcane in Brazil



Source: MAPA – Annual Sugarcane and Agroenergy Balance, 2007.

accounted for most of this expansion in the total area planted with sugarcane, with an increase of 5.9% in the 2005-2006 harvest as compared to the 2004-2005 harvest.

As a result of the expansion of the sugarcane planted area in Brazil, particularly in São Paulo, sugarcane plantations have been encroaching on pasture areas that became more efficient and, therefore, less land is needed for raising the same cattle, releasing useful areas. These plantations have also been encroaching on some areas occupied by orange orchards in the past, which, in some cases, became less profitable, as well as on other areas in which corn and soybeans are being grown.

In addition, sugarcane plantations have been extending beyond the borders of the most traditional sugarcane-producing regions and states, such as the *Zona da Mata* (forest zone) region in the Brazilian northeast region, which spreads throughout the states of Paraíba, Pernambuco and Alagoas and Piracicaba and Ribeirão Preto, in the state of São Paulo.

Sugarcane plantations have also been encroaching on areas inside the Amazon region, particularly in the state of Pará. In fact, sugarcane production in the state of Pará, which amounted to 340.4 thousand tons in the 2000-2001 harvest, increased to 512.3 thousand tons in the 2005-2006 harvest. The state of Amazonas also experienced an increase in production from 186,900 to 252,700 tons during the same period. In the state of Tocantins, where no sugarcane had been planted until 2005, production totaled 95.3 thousand tons in the 2005-2006 harvest.

If confirmed, the estimated expansion in the sugarcane planted area in Brazil, mainly as a result of positive prospects for increasing ethanol production, will more than double the planted area over the next ten years.

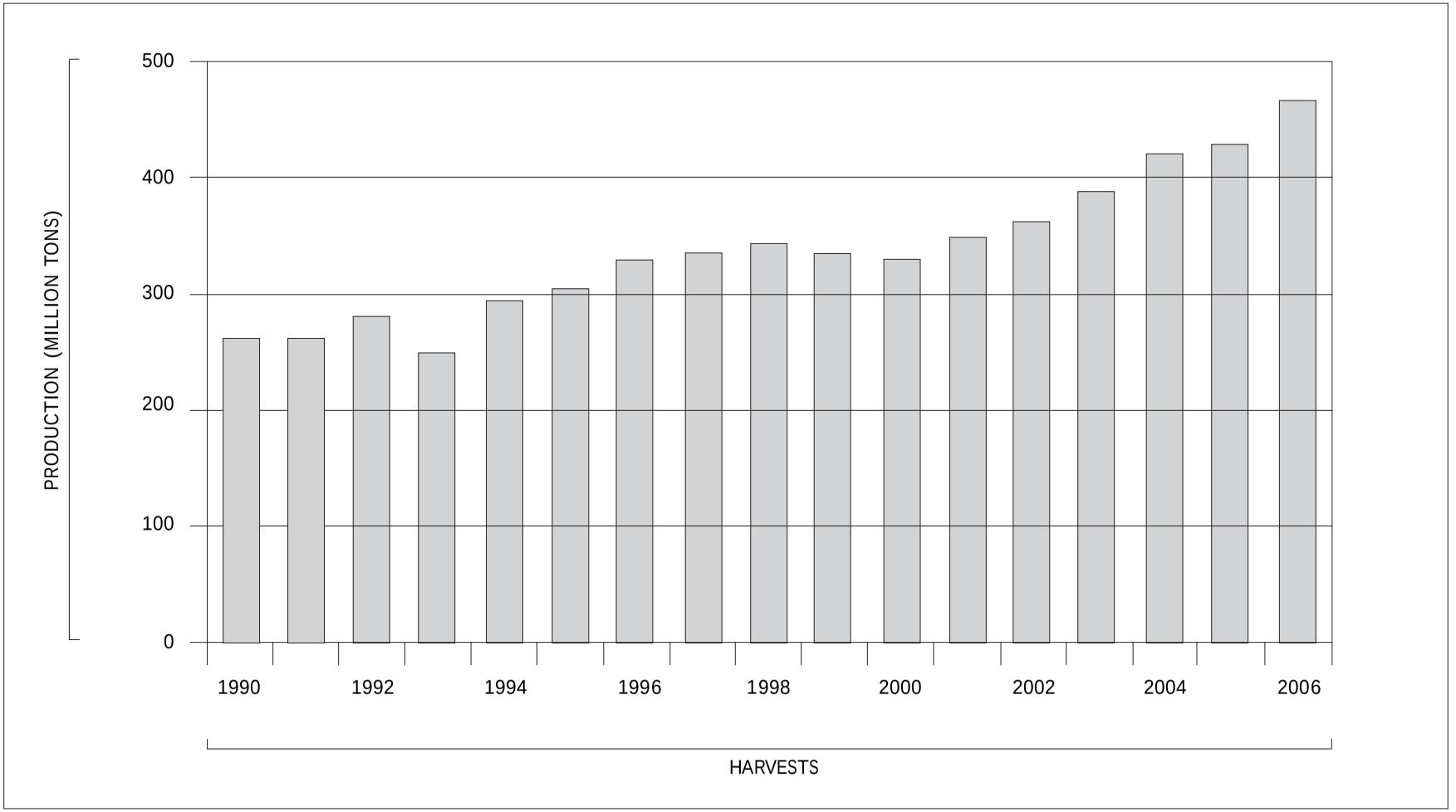
Given that the sugarcane planted area has been increasing, discussions are currently focused on ensuring the availability of land to support such expansion. Two issues are involved here: (i) a trend toward replacing crops (including subsistence crops) with sugarcane plantations, mainly due to expectations of an increasing demand and profitability determined by the international context; (ii) sugarcane plantations encroaching on environmentally fragile areas such as the *Pantanal* region in the state of Mato Grosso and the Amazon region.

In this connection, the sugar/ethanol industry has been taking measures to ensure that such expansion will be achieved through the occupation of degraded areas, particularly areas that were initially used for raising cattle and then abandoned (UNICA, 2007). Contradicting these arguments, it should be highlighted that the expansion of sugarcane plantations will require continuous areas with ideal planting conditions, such as fertile soil, availability of water, adequate soil declivity and infrastructure. Areas currently degraded cannot ensure that the expected expansion will take place under environmentally appropriate conditions, corroborating the two above-mentioned lines of thought.

According to data provided by the União da Agroindústria Canavieira de São Paulo - UNICA (*Sugarcane Agroindustry Union of São Paulo)* (UNICA, 2007), apart from the 306 units operating today, 86 new projects for building plants were developed. New investments are particularly intense in areas located in the mid-west region, in the states of Mato Grosso do Sul, Mato Grosso and Goiás. The state of Paraná, located in the south region, is the second largest sugarcane producer in the country already. The new projects will be implemented in the states of Rio de Janeiro, Minas Gerais and Espírito Santo, as well as in Bahia and Maranhão, located in Brazil's northeast region.

An increasing demand for renewable fuels in both domestic and external markets, particularly for ethanol, has been attracting new investments for developing new sugarcane cultivation areas. UNICA estimates investments of R$ 17 billion until 2012, most of them from domestic groups with experience in the sector that already own other plants in Brazil, confirming a concentration trend in the sugarcane industry. There are also some new investors who are eager to take part in this industry, attracted by the ethanol "rush" and by the possibility of achieving extraordinary profits. About 5% of the total investment will come from international groups with experience in producing sugar, as well as from investment funds without any

Figure 2
Evolution of Sugarcane Production in Brazil



Source: MAPA – Annual Sugarcane and Agroenergy Balance, 2007

specific experience in the sugar/ethanol industry.

It should be highlighted that the percentage estimated by the foreign investment market (5%) is only an estimate widely disseminated by UNICA. Official agencies, ministries, institutes, and promotion banks don't have this information yet, although they recognize the need to have it. Although the media often disseminates new financial investments in the sector, precise information is lacking on the how these funds are being used, which may be applied to buying land, carrying out research, developing infrastructure or making other investments not directly related to the sugarcane production. These investments can also be made jointly with established domestic groups that also raise capital. Furthermore, foreign companies might be taking advantage of domestic companies acting as "ghost companies," making it even harder to identify foreign investments.

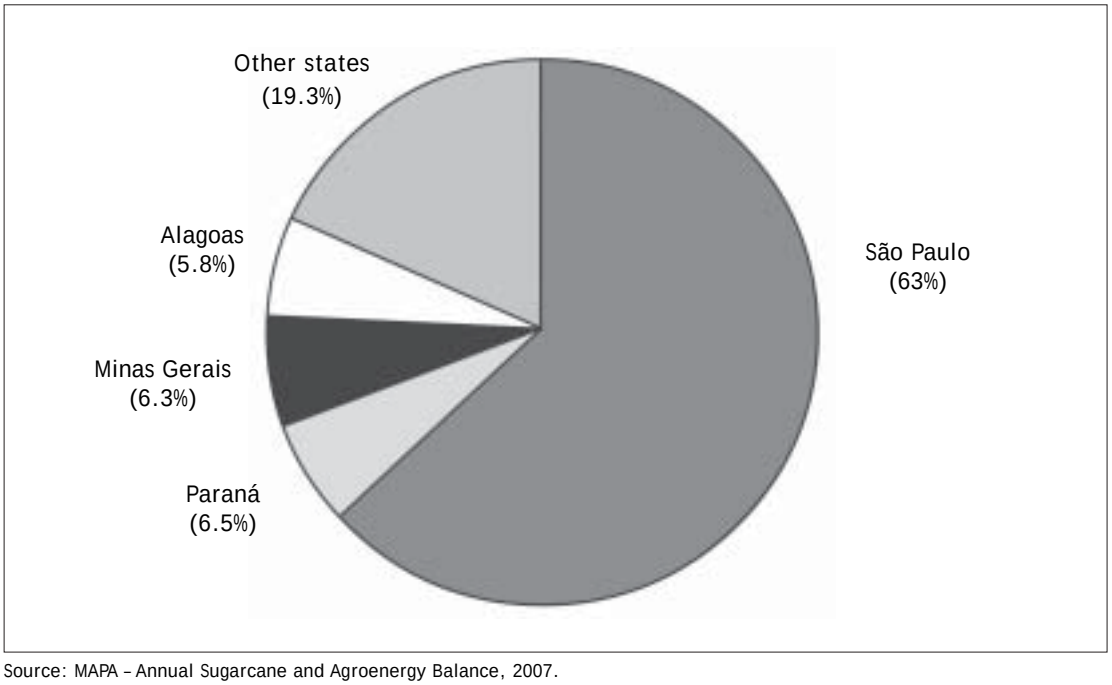
Apart from the expansion of the area planted with sugarcane, another important aspect refers to the evolution of sugarcane production in Brazil. Figure 2 shows this evolution between 1990 and 2006.

Still based on data from the 2002-2003 to the 2005-2006 harvests, it can be noticed that the average increase in sugarcane production throughout producing regions amounted to 14%. The southeast region experienced the highest percentage increase, 19%, and the state of São Paulo alone accounted for 63% of the country's total production, as shown in figure 3.

Sugarcane production is mainly concentrated in the center-south region, which accounts for about 85% of the domestic production through 236 plants. In the state of São Paulo alone there are over 100 plants, and the states of Paraná and Minas Gerais also account for a major percentage of this production. In the northeast region, Alagoas the main sugarcane-producing state, while Pernambuco accounts for about 4% of the domestic production.

While production is concentrated in a small number of states, sugarcane plantations are widely spread throughout other states such as Goiás, Mato Gross, and Mato Grosso do Sul, evincing a recent process of incorporating new areas.

Figure 3
Distribution of crushed sugarcane production by state - 2005-06 harvest



Source: MAPA – Annual Sugarcane and Agroenergy Balance, 2007.

1.2. Ethanol production, consumption and export in Brazil

Table 2 shows data on the evolution of ethanol production between 1982 and 2006, identifying the production of anhydrous alcohol (which is added to gasoline) and hydrated alcohol (which is used as fuel in the so-called "ethanol-fueled cars") in each of the harvests under consideration.

It can be noticed that production of hydrated alcohol has been as inconstant as PRÓALCOOL over the past thirty years. An ethanol supply crisis, marked by the intermittent lack of ethanol in Brazil's main cities, broke out in April 1989 and affected gas stations even in Ribeirão Preto and Sertãozinho, which concentrated 40% of the ethanol produced in the state of São Paulo and accounted for seven of the eleven billion liters of ethanol produced in Brazil.

Production of hydrated alcohol was resumed in 2003 due to the development of the so-called *flex fuel* vehicles, which can be fueled with gasoline and/or ethanol at any proportion.

Production of anhydrous alcohol, in turn, depends on variations in the gasoline- anhydrous-alcohol mixture which are defined by the Conselho Interministerial de Açúcar e Álcool – CIMA (*Interministerial Sugar and Ethanol Council*) at proportions varying from 22% to 25%. The environmental benefits of replacing gasoline with ethyl alcohol should be highlighted. Added at a 22-25% proportion to gasoline, anhydrous alcohol acts as an antiknock agent (see box 1), which allows it to replace the poisonous tetraethyl lead. Without any doubt, were it not for the gasoline-alcohol mixture, the cocktail of greenhouse gas emissions made up of carbon monoxide, hydrocarbons, nitrogen oxides and sulfur, plus heavy metals such as lead, would be much more harmful to the health of people who live in large Brazilian cities.

Carbon monoxide is a toxic, colorless and inodorous gas released by the incomplete combustion of fossil fuels. It reduces the capacity of the blood to transport oxygen, thereby causing oxygenation problems in organ tissues and affecting our reasoning and perception. At high concentrations it can kill humans. The 22% anhydrous alcohol mix reduces CO emissions by 15%, while hydrated alcohol reduces them by 50%.

Hydrocarbons (HC), which are substances made up of hydrogen and carbon whose relation with cancer has been studied, are known as one of the precursors in forming (low-altitude) tropospheric ozone. They are considered toxic substances because, at high concentrations, they affect lung functions and respiratory resistance to infections. A 20% reduction in these emissions can be achieved with the 22% anhydrous alcohol mixture, while with hydrated alcohol they can be reduced by 50%, as with CO.

Table 2
Ethanol production in Brazil in the 1982-2006 period (in cubic meters)

Harvest	Hydrated Alcohol	Anhydrous Alcohol	Total
1982/83	3,549,405	2 ,273,634	5 ,823,039
1990/91	1,286,568	10,228,583	11,515,151
1995/96	3,057,557	9,659,202	12,716,759
2000/01	5,584,730	4,932,805	10,517,535
2003/04	8,767,898	5,872,025	14,639,923
2005/06	7,663,245	8,144,939	15,808,184

Source: MAPA – Annual Sugarcane and Agroenergy Balance, 2007.

Box 1: Detonation and antiknock additives

DETONATION
Explosion of the mixture under pressure. A fuel's resistance to detonation is an extremely important characteristic. The effects of detonation are harmful to an engine. Frequent detonations can overheat and destroy engine parts. Antiknock power is a fuel's resistance to detonation.
ANTIKNOCK ADDITIVES
Tetraethyl lead is an antiknock chemical product, but not a fuel. It is added to gasoline at proportions of up to 1 ml/l. However, its use is very dangerous because of its toxic lead-containing emissions. Using alcohol (fuel anhydrous ethyl alcohol) was the main option for eliminating the use of tetraethyl lead in Brazil. Usually, alcohol is added to gasoline at percentages ranging from 20% to 25% of the total volume. Using MTBE (methyl tertiary-butyl ether) has been a good choice in relation to tetraethyl lead because, unlike ethanol, it doesn't cause significant environmental impacts and doesn't reduce the heating power of the mixture. Widely used in the United States, it is an antiknock additive standardized by the European Economic Community. In Brazil, it is used in the state of Rio Grande do Sul. It is added to gasoline at a percentage of 15% at most.

Source: Professor Sérgio Barbosa Rahde, Departamento de Engenharia Mecânica da Pontífice Universidade Católica (PUC - Catholic University/Mechanical Engineering Department - Internal Combustion Engines)

As regards nitrogen oxides (NOx), which like hydrocarbons are precursors in forming low-altitude ozone, the 22% anhydrous alcohol mixture increases emissions, which are reduced by 14% with hydrated alcohol.

Aldehyde (substances resulting from the incomplete oxidation of alcohols that can cause extreme irritation of the nasal mucosa and cancer) emissions from hydrated alcohol are considerably high, twice those from pure gasoline. In 22% anhydrous alcohol mixtures, aldehyde emissions are the same.

Despite an increase in both hydrocarbons and aldehydes, their impact on air quality is not significant, since the acetates emitted by alcohol are less harmful to our health as compared to those emitted by fossil fuels (Coelho, 2005).

According to recent data, Brazil's current ethanol production capacity is seventeen billion liters (or seventeen million cubic meters). As a result of a record sugarcane harvest expected for 2007-2008, the Companhia Nacional de Abastecimento – CONAB (*National Supply Company*) anticipates a production of 20.01 billion liters of ethanol (*O Estado de São Paulo* newspaper, 06/01/2007, p. B20).

Table 3 shows the evolution of ethanol consumption in Brazil between 1990 and 2005.

Early in the 1990s, consumption of hydrated alcohol had already dropped because of the supply crisis in 1989. Production of hydrated alcohol-fueled vehicles, which accounted for 95% of the fleet in 1984, dropped to 63% of the total production in 1988; to 47% in 1989; 10% in 1990; 0.44% in 1996; 0.06% in 1997; 0.09% in 1998; 0.92% in 1999; 0.69% in 2000; and 1.02% in 2001. In the following years, the percentage of hydrated alcohol-fueled vehicles was insignificant; 0.1% in 2003, 0.03% in 2006, and 1.5% in 2007, considering data provided by Associação Nacional

Table 3
Ethanol consumption in Brazil

Period	Anhydrous (million cubic meters)	Hydrated (million cubic meters)	Total (million cubic meters)
1990	1,278	11,112	12,390
1995	3,491	11,021	14,512
2000	5,933	6,453	12,386
2003	7,392	4,520	11,912
2005	7,775	6,214	13,989

Source: MME/EPE, 2006.

Table 4
Evolution of ethanol exports in Brazil

Year	Amount (thousand cubic meters)	Value (million US$ FOB[1])	Average price (US$/cubic meters)
1990	37	7.41	248.77
1995	320	106.92	417.55
2000	227	34.79	153.07
2003	656	157.96	240.69
2005	2,598	746.71	294.29
2006	3,429	1,605.00	468.11

[1] FOB: Free on Board. The term means that the seller is the one who clears the goods for export and is responsible for them until they pass over the ship's rail at the named port of shipment.

Source: MDIC, 2006; UNICA, 2007.

dos Fabricantes de Veículos Automotores - ANFAVEA *(National Association of Vehicle Manufacturers)* for January-May 2007.

In March 2003, *flex fuel* vehicles (fueled by both ethanol and gasoline) began to be produced, boosting the sugar/ethanol industry. According to data provided by ANFAVEA, *flex fuel* vehicles accounted for 4.5% of the Brazilian fleet in 2003; 16.6% in 2004; 34.3% in 2005; 53.3% in 2006; and 61.2% in 2007 (data from January to May 2007).

As for the expected demand in 2010, according to a recent study carried out by Banco Nacional de Desenvolvimento Econômico e Social – BNDES *(National Economic and Social Development Bank)*, it will be necessary to produce an additional eight billion liters of ethanol just to supply the domestic market.

Nevertheless, the need to ensure the supply of ethanol in Brazil's domestic market is also associated to a new international context that has been increasingly demanding ethanol production to supply foreign markets, as the data on the evolution of ethanol exports shown in table 4 suggest.

Ethanol exports are on the rise. Insignificant in 1990, they began to increase in 2003, hitting the mark of 2.6 billion liters in 2005 and of 3.43 billion liters in 2006.

In 2006, 51.2% of the ethanol produced in Brazil was exported to the USA; 10.1% to the Netherlands; 6.7% to Japan; 5.9% to Sweden; 5.3% to El Salvador; 3.9% to Jamaica, and 3.0% to Venezuela. These are the seven main importers of Brazilian ethanol.

1.3. Main strategies of the sugar/ethanol companies

Technological innovations have been developed in all areas of the sugar/ethanol industry, taking into account administrative, genetic and technical issues. These innovations have been implemented with the aim of increasing productivity and reducing both production costs and environmental pollution. Different groups operating in this industry have been carrying out research to promote genetic improvements in sugarcane varieties and in agricultural production management (through tools such as soil maps, satellite images, appropriate soil declivity, fertilization and distance), advances in extraction processes, juice processing, fermentation and distillation, and also energy improvements by using sugarcane bagasse under a cogeneration regime (simultaneous steam production for plant's productive process and for generating electricity) and have also adopted new administrative management models.

Macedo (2007) identified two distinct periods of changes in the sugar/ethanol industry in Brazil with the following features:

1980-1990 period:

- Large-scale introduction of sugarcane varieties developed in Brazil.
- Development of full use of vinasse in fertirrigation.
- Biological control in sugarcane production.
- Development of the four-cylinder crushing system.
- Technology for large-sized "open" fermentation processes.
- Increased electricity production in the industry (cogeneration aiming at achieving self-sufficiency).
- End use: ethanol specifications; ethanol transportation, mixture and storage.

1990-2000 period:

- Optimization of sugarcane cutting, loading and transportation.
- Sugarcane genome mapping; genetic changes.
- Harvest mechanization.
- Production of electricity surpluses and their sale to concession-holders.
- Advances in industrial automation.
- Advances in technical management (agricultural and industrial).
- Introduction of *flex fuel* engines.

The most relevant strategies from a technological point of view will be analyzed below.

1.3.1. Technological strategies

a. Genetic advances

Sugarcane producers have recognized that incorporating new sugarcane varieties is an important strategy for increasing both their productivity and profitability. The Centro de Tecnologia Canavieira – CTC (*Sugarcane Technology Center*) has been developing sugarcane varieties that adapt better to different types of weather, less fertile soils and mechanization processes and are more productive and resistant to diseases and pests. In recent years, sugarcane producers have

been making an effort to use more productive varieties containing high contents of Total Recoverable Sugar (TRS).

It takes from ten to twelve years in average to develop a new tradable variety, meaning that long-term planning is required in this process. The main elements for selecting the best sugarcane variety are soil identification, weather and management, as well as analyzing the characteristics of each variety, its behavior, profile and performance in each harvest. The next step is defining the selected variety, associating it to the production environment (soil, weather and management).

b. Biological control of pests X pesticide use

Pesticides (herbicides) have been used in sugarcane plantations in quantities which vary from one year to the next but which stand out as compared to other commercial crops. Only citrus plantations and soybeans crops use greater quantities of such products than sugarcane plantations and significantly lower quantities are used in coffee and corn crops, as shown in table 5.

Table 5
Pesticide use in major commercial crops

Herbicide consumption	Year	Coffee	Sugarcane	Citrus	Corn[1]	Soybeans[1]
Commercial Product (kg/ha)	1999	3.38	2.78	3.23	2.51	4.44
	2001	3.99	5.24	5.80	2.84	4.57
	2003	2.42	4.14	6.69	3.31	4.92

[1] The use of pesticides for treating seeds was taken into account.

Source: Macedo (2007), based on data provided by SINDAG and IBGE/CONAB.

However, the sugar/ethanol industry has been carrying out research into biological control of sugarcane pests. Tons of spores of the *Metarhizium anisopliae* fungus, cultivated in rice grains, have been replacing insecticides for controlling sugarcane froghopper. Sugarcane borer (*Diatraea saccharalis*) is another pest commonly found in sugarcane plantations. To control this pest, *Cotesia flavipes* insects, whose larva feeds on sugarcane borer, are reproduced in laboratories to control the pest without using chemical products, thus contributing to preserve the environment (COSAN, Agricultural Department, 2007).

c. Environmental issues: burning, water use, and vinasse disposal

■ *Burning*

When burning is used in dry periods (between July and September), a significant increase is observed in the concentrations of both carbon monoxide (CO) and ozone (O_3), as well as of

particulate substances, hydrocarbons, nitrogen oxides, and carbon dioxide (CO2), which is released at a proportion of 2.1 tons per hectare of burned sugarcane. High emissions of particulate substances from burning straw have been causing serious health problems across different sugarcane-producing regions, because these substances cross the nasal barrier and affect the bronchial tubes, causing different infections.

The following considerations on human health and sugarcane burning were made by Franco (1992): (i) during the sugarcane burning season, air quality is affected; (ii) sugarcane burning is not the only factor which jeopardizes air quality, but because of the large size of the planted area and the long burning period (from late April to early November), the release of gases and other pollutants into the region's atmosphere cause significant impacts that should not be despised; (iii) the population at risk, whose quality of life and health are affected by adverse atmospheric conditions, is quite significant; (iv) most people in this population are forced to see doctors much more often, are more often hospitalized and require more medication and ambulatory treatment. Healthcare services and the economies of families are overburdened as a result.

■ *Water use*

Thirteen liters of water are required for producing one liter of ethanol, in which process twelve liters of vinasse are produced, which is an extremely pollutant subproduct often used for fertilizing sugarcane plantations.

A study carried out by the CTC shows that there was a significant reduction in the water consumed by plants in Brazil's center-south region in the past decade. According to this survey, the average water consumption in 1990 was 5.6 cubic meters per ton of sugarcane produced. Seven years later, the average consumption was 5.07 cubic meters per ton. According to more recent data, from 2005, plants use, in average, 1.8 cubic meter of water per ton produced.

This lower water consumption was mainly brought about by closed water circuits, which allow water to be reused, that is, they make it possible for the same waste to be reutilized. Sugarcane washing, for example, is a production stage that consumes a lot of water. There are two ways to reduce water consumption in this case: one is using closed water circuits and the other is to simply stop washing sugarcane. However, in order to stop washing sugarcane, plants must take a further step to protect the environment: they need to stop burning sugarcane in the harvest season gradually.

Raw sugarcane, which is obtained from mechanized harvesting, cannot be washed because a lot of sugar is lost in the process. For this reason, plants which already harvest raw sugarcane contribute toward reducing water use during production.

■ *Vinasse disposal*

Vinasse is a very important subproduct of the sugar and alcohol manufacturing process not only because of its produced volume (approximately twelve liters for each liter of ethanol produced), but mainly because of its polluting power.

When vinasse is disposed of in watercourses, they become inappropriate to be used by humans and water animals and plants are killed as a result of high rates of Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Combined with wastewater, vinasse has a high volume (10.85 per liter of ethanol) and an organic load of about 175g BOD 5 per liter of ethanol (Marzabal Neves *et al.*, 1994). Vinasse is applied in sugarcane plantations together with wastewater (for washing floors and purging closed circuits and condensed leftovers), promoting fertirrigation with utilization of nutrients.

Today, vinasse is fully used for fertirrigation purposes. The percentage of the area where fertirrigation is applied varies a lot; some plants apply vinasse in up to 70% of their planted area, while in others this percentage is much lower. However, this percentage has been generally increasing at each harvest, as industrial plants have been making an effort to use vinasse more rationally to ensure a higher agricultural productivity and reduce the use of chemical fertilizers.

d. Harvest mechanization

The process of mechanizing sugarcane cutting in the harvest season is meant to reduce the costs involved in this process. Thus, apart from environmental issues related to emissions from sugarcane burning, factors such as economic feasibility, investment return rate, governmental incentives and political and social conditions are taken into account by companies in their investment decisions (Gonçalves, 2005).

With the technology available today, harvest mechanization can only be applied in flat areas or in locations with a 12% declivity at most.

Considering the state of São Paulo, Veiga Filho (2002) estimated that mechanized regimes of sugarcane cutting are being used on 35% of the planted area in 2002. According to estimates of Coelho (2006), between 80% and 85% of the planted area in that state can be mechanized today. Still according to him, 30% have been mechanized already, leaving a potential of 70% to be explored.

Braunbeck & Cortez (2005) estimated that, in the 1997-1998 harvest, six hundred harvesting machines were used, accounting for the harvesting of 10% of the sugarcane produced. They also estimated that the cost of mechanized harvesting is less than US$ 2/t, while the harvesting of burned sugarcane using labor costs US$ 4/t. For cutting raw sugarcane, labor costs would rise to US$ 6/t; for mechanized harvesting, the cost would be US$ 3/t (Braunbeck *et al*., 2006). Despite a high uncertainty in relation to costs, the available data suggest that mechanized harvesting is more effective than hiring labor.

Mechanized harvesting impacts significantly on labor, as each harvesting machine replaces from forty to sixty workers and creates five or six jobs for skilled workers.

A consensus among experts is that mechanized harvesting with previous sugarcane burning is more profitable. Harvesting machines lose 40% of their operating capacity when they cut raw sugarcane (Gonçalves, 2005; Alves, 2006, interview; Braunbeck *et al.*, 2006). For this reason, sugarcane burning practices are still adopted in many mechanized areas.

Veiga Filho & Negri Neto (2002) stress that, today, the sugarcane/ethanol industry is striving to introduce innovations allowing for a qualitative leap with a view to increase the industry's productivity. Expanding raw sugarcane harvesting seems to be one of their plans. Braunbeck & Cortez (2005) mention the following bottlenecks for further modernizing harvesting practices:

- Both the performance of harvesting machines and harvesting costs should not be very much affected by the amount of straw.
- Technology should allow for the straw to be partially removed because of its significant energy potential and because at this moment there are no appropriate sugarcane varieties or agronomic experience for managing sugarcane plantations in which straw is used to cover the soil.
- Harvesting machines must leave part of the straw in the fields to control weeds and conserve moisture, in cases where agronomic management techniques are well applied.

- The technology applied must preserve the entire current system of processing the whole sugarcane, in order to avoid unnecessary investments for replacing it with chopped sugarcane and saccarose losses during cutting and cleaning processes, which would constitute an unacceptable setback.

Today, the average production of a single harvesting machine in sugarcane plantations is from 500 to 550 tons of raw sugarcane a day (COSAN, *Jornal da Cana*, June 7, 2007). With the aim of increasing production, harvesting-machine manufacturers have been using a floating-base cutting system which "copies" the relief during the harvesting operation using tracks instead of tires. According to data provided by the manufacturer, the John Deere company manufactures a model that can produce from 1,000 to 1,200 tons of raw sugarcane a day with a floating-base cutting system.

e. Hydrolysis

Hydrolysis has been researched since the years of the PRÓALCOOL program. Its function consists in utilizing bagasse and sugarcane straw as raw material to break cellulose and hemicellulose molecules, turning them into sugar. This can be done in two different ways: in the form of acid or enzymatic hydrolysis. For a hydrolysis reaction to be obtained, a catalyzer must be used which can be an acid, but the reaction is slow and its performance is weak, in addition to favoring the degradation of sugar before the reaction is over (Di Ciero, 2006).

In enzymatic hydrolysis, the catalyzer is an enzyme produced from cell material. Although there is no degradation in this process, it is a slow process that can take from 60 to 72 hours to occur. Research has shown that, to be feasible, it will be necessary to use acid hydrolysis combined with the use of an organic solvent known as organosolv. This combination makes it possible, albeit not on an industrial scale, to complete the process in less than twenty minutes with a content of acquired sugar of 10% to 20%, a little lower than that of sugarcane juice, from which 14-16% can be obtained (Coelho, 2007).

Although hydrolysis has not been used on an industrial scale so far, its process is being tested in pilot units, where its potential to increase production has been confirmed. The Dedini company, for example, has a pilot plant in operation in the São Luís plant, in the municipality of Pirassununga (state of São Paulo), which began to produce, in 2002, cellulosic ethanol from sugarcane bagasse at a cost of US$ 0.40 per liter. Using the acid hydrolysis process, a semi-industrial plant can produce 5,000 liters of ethanol a day processing two tons of bagasse per hour. Initial production costs dropped due to technological improvements and the product costs US$ 0.27 per liter now, while traditional ethanol costs from US$ 0.18 to US$ 0.20 per liter (*O Globo* Portal, May 14, 2007).

With the hydrolysis process, a plant could increase its ethanol production by 30%, although some estimates suggest that an increase of up to 87% can be obtained.

1.3.2. Management strategies

After the sugar/ethanol industry was deregulated, several plants professionalized their management. Management positions, which used to be held by partners of the plants, often for two or three generations, are now being filled by experienced executives with a professional vision, avoiding conflicts of interest which resulted in less funds being allocated.

Late in the 1990s, several mergers and acquisitions took place, concentrating the market in the hands of groups with a strategic vision and leading to the incorporation of smaller plants or of poorly managed plants. In 2005, a sugar/ethanol group was capitalized for the first time through an initial offering in the stock exchange, leading other groups to follow suit and confirming a trend toward market concentration.

1.4. The sugar/ethanol industry and public authorities

In the first two decades of the PRÓALCOOL program, investments of about US$ 11.7 billion were made, US$ 7.4 billion of which with public funds in the form of subsidies and other financial support mechanisms (credit for investment, for example), with the aim of ensuring the feasibility of ethanol production.

When the international oil price went up, subsidies were no longer necessary to ensure its feasibility. However, debts incurred in this first phase were never paid off due to agreements made between plant owners and the federal government, particularly with its financial agents, Banco do Brasil and Caixa Econômica Federal.

1.4.1. Funding

BNDES anticipates investments in the order of R$ 100 billion in all the links of the ethanol production chain until 2011. The projected amount includes investments in transportation and storage logistics and in developing banking and trade-related services. Of the total estimated amount, R$ 20 billion will be exclusively earmarked for building new plants and generating energy from sugarcane bagasse. BNDES can finance up to half of these R$ 20 billion.

The ethanol industry has been a major applicant for BNDES funds. Ethanol production has been on the rise for three years and investments in it have increased significantly in the past four years. BNDES alone released R$ 1.974 billion for funding ethanol and sugar projects in 2006, virtually twice the total credit disbursed in 2005 (R$ 1.098 billion). In the first quarter of 2007, BNDES had already granted financings amounting to R$ 723 million to this industry.

BNDES's funding costs have dropped as a result of a decrease in the Long-Term Interest Rate, which is currently 6.5% a year. The bank charges interest rates of 2% a year to fund industrial projects, of 1.5% to fund the purchase of equipment, and of 1% to finance bioelectricity projects.

Today, BNDES's portfolio includes seventy projects for ethanol production and co-generation of electricity from sugarcane bagasse, including loan applications under analysis, projects that have been approved already and disbursements under way. Its portfolio involves R$ 12 billion in investments, R$ 7 billion of which consist in financings.

The investments estimated until 2011 are focused on meeting domestic demand, which has increased as a result of a steady increase in the fleet of *flex fuel* cars in Brazil.

An anticipated increase in ethanol exports, which amount to 3.43 billion liters currently, has not been taken into account in the bank's calculations. In order to meet this rising domestic demand, ethanol production will have to increase from 17 billion liters now to 24 billion liters by 2011, meaning that from 80 to 100 new plants will have to be established.

The sugar/ethanol industry believes that its growth will be accompanied by greater productive and management modernization. Traditional manufacturers will have to modernize their operations to raise funds in the financial market and compete with new investors, both domestic and foreign.

1.4.2. Environmental laws

a. Vinasse disposal

In 1978, Ministerial Ruling n. 323, dated November 29, prohibited the direct or indirect disposal of vinasse into any water body. Since then, vinasse has been used as fertilizer in sugarcane plantations.

b. Less sugarcane burning

In the state of São Paulo, state law n. 11,241, dated September 19, 2002, determined that sugarcane burning in mechanized areas was to be gradually reduced and that this practice should be fully eliminated by 2021. In non-mechanized areas with more than 150 hectares, sugarcane burning is to be eliminated by 2031.

As a result of the obligation to eliminate sugarcane burning practices gradually as a means to facilitate the manual cutting of sugarcane, mechanized harvesting expanded quickly, leading to a reduction in different jobs (see item 1.6).

1.4.3. Infrastructure

With investments in the order of R$ 500 million, PETROBRAS has plans to build an alcohol pipeline that will transport ethanol produced in plants located in the state of Goiás to the state of São Paulo. This pipeline will end in the Paulínia Refinery, located in the metropolitan region of Campinas. From there, the ethanol will be transported to the São Sebastião port, in the north region of São Paulo. The pipeline will have the capacity to transport four billion liters and it is the first of several projects designed to improve the ethanol transportation infrastructure.

Apart from the above-mentioned alcohol pipeline, innovations have been introduced in ports during the past three years. An ethanol exporting terminal was built in the port of Santos (state of São Paulo) under a partnership involving different sugar/ethanol groups with the aim of establishing a specific terminal for exporting ethanol. It was established for the purpose of facilitating ethanol exports for its members and other market agents. It will be the first terminal exclusively devoted to ethanol in Brazil's center-south region and it constitutes a major first step toward logistical development. Today, the Ethanol Exporting Terminal of Santos has a storage capacity of 40,000 cubic meters of ethanol. It is expected that, in two years, in a second stage, this capacity will be expanded to 80,000 cubic meters (COSAN, 2007).

1.4.4. Certification

The Brazilian Government is implementing an agrofuel (ethanol and biodiesel) certification process with a view to awarding a quality label to alternative fuels, so as to enable them to win international recognition.

This certification will identify fuels produced in a sustainable way, that is, fuels which comply with all environmental protection and social requirements by not exploiting labor in the production chain. It will also create conditions for alternative fuels to be traded internationally and listed in stock exchanges, like any other commodity.

1.5. Participation of family agriculture in the sugar/ethanol industry production

When the PRÓALCOOL program was launched, the idea was that no plant would mill more than 50% of the sugarcane produced by it, so as to force plants to buy at least 50% of the raw material they would use from farmers. This requirement, which contemplated and prevented one of the most negative aspects of PRÓALCOOL's current model – land monopolization by plant owners -, was eliminated late in the 1980s as a condition to get loans from the IMF.

Table 6 shows the evolution of the distribution of the production of sugarcane crushed in one's own plant and bought from suppliers between 1982 and 2006.

Table 6
Distribution of the production of sugarcane crushed in one's own plant and bought from suppliers

Harvest	Total (in t)	Own plant (in t)	%	Suppliers (in t)	%
1982/83	166,178,592	79,765,724	48 %	86,412,868	52 %
1990/91	222,429,160	133,457,496	60 %	88,971,664	40 %
1995/96	249,876,575	144,697,685	58 %	105,178,890	42 %
2000/01	254,921,721	173,559,726	68 %	81,361,995	32 %
2003/04	357,110,883	228,428,646	64 %	128,682,237	36 %
2005/06	382,482,002	232,462,389	61 %	150,019,613	39 %

Source: MAPA – Annual Sugarcane and Agroenergy Balance, 2007.

The data shown in table 6 should be carefully considered, since the production of suppliers is not necessarily from family agriculture. Plants might be buying sugarcane from other large farmers. In addition, the information does not necessarily refer to ethanol production, but to sugarcane in general, including both sugar and ethanol production. However, the data show how the mechanism initially established by PRÓALCOOL was gradually discarded, thus stimulating monoculture-based schemes.

In addition, ethanol from sugarcane was not the only alternative that was considered initially. An initial project for producing fuel from biomass proposed the use of manioc for this purpose, because of its higher yield in relation to sugarcane for producing ethanol. Small farmers could grow and sell manioc to plants and have a source of carbohydrates for their own consumption. Under this project, farmers could also feed, with manioc branches, part of their cattle, which would in turn offer them a source of protein.[2]

As opposed to what the original project contemplated, a small number of huge plants (325 altogether) mill about 420 million tons of sugarcane (2006-2007 harvest) today, concentrating wealth and imposing a heavy burden on the distribution logistics.

[2] See AL, J.W. Bautista: *Soberania e dignidade; raízes da sobrevivência*. Rio de Janeiro, Ed. Vozes, 1991 (particularly chapter IV: *Poder energético dos trópicos; futuro do PRÓALCOOL*, pp. 97-139). See also SANTOS, H. de Castro; *Política e políticas de uma energia alternativa; o caso do PRÓALCOOL*. Rio de Janeiro, Ed. Notrya/ANPOCS, 1993 (particularly pp. 11-60).

1.6. Labor relations in the sugar/ethanol industry production

Until the 1950s, sugarcane workers used to cut sugarcane and tie it into bundles with its leaves when raw sugarcane was cut. They then carried the bundles on their shoulders to small trucks. In those days, sugarcane fields were smaller. Each worker used to cut sugarcane in two or three "streets" separating different fields and a small number of men used to work in each field. They usually lived in the farms. In the 1960s, as production units increased, sugarcane began to be burned to increase the productivity of the cutting operation and it was no longer tied into bundles. At this point, as tilling and planting operations were mechanized, the size of sugarcane fields was redefined. When sugarcane began to be burned, productivity increased from two to five tons a day, creating the need to hire workers to "throw" sugarcane into the back of trucks. Later, mechanical hoists began to be used to pile and carry sugarcane from the ground to the trucks. At this point, workers known as *bituqueiros* began to be hired to gather and pile sugarcane that those hoists could not reach as sort of assistants of these machines. This was not heavy work and therefore the age of these workers was not an issue; many women were hired to perform this task (Ricci, 1994).

In a recent survey of the expansion of the sugar/ethanol industry and its impacts on the labor market in the city of Piracicaba (SP), Terci & Peres (2003) identified two different types of temporary workers: the so-called *bóias-frias* - typical non-skilled workers who live in a city and take up jobs in rural and urban areas alternately - and "harvesters", who are temporary workers hired by plants through their agents in other states to cut sugarcane. There are several differences between these two types of workers. Harvesters, for example, are recognized by unions as the best workers, because of their higher productivity.

According to the authors, the differentiated conditions experienced by harvesters, who account for 50% of the labor force in sugarcane plantations, explain their relatively greater productivity. They stay in separate lodgings made available by the plants, are given hot meals and can stay focused on their work because their families stay back in their homes. Their situation is very different from the one experienced by migrant workers who live in Piracicaba, who usually live in the outskirts of the city and face harsh economic conditions. In addition, because they don't have any professional training or a permanent job, they end up engaging in any kind of activity, accepting very low wages to perform extremely hard tasks without any formal employment bonds, reproducing deeply degrading working conditions.

The sugar/ethanol market experienced three great changes which had a direct impact on the employee-employer relationship. The first one was the governmental investment in the PRÓALCOOL program in the 1970s, which increased the processing capacity of plants remarkably. The second one was the deregulation of the industry early in the 1990s. The third one has been taking place since 2004, as a result of mergers and acquisitions of plants involving both domestic and foreign capital. In the early stages of the PRÓALCOOL program, sugarcane cutters known as *bóias-frias* used to work under precarious conditions in rural areas. As PRÓALCOOL consolidated itself, larger plants were built and, consequently, more of these workers were hired, creating favorable conditions for them to get organized and claim better working conditions. This process culminated in huge strikes in the 1980s, particularly in 1984, when, among other things, these workers claimed the end of the sugarcane cutting system in seven "streets" in sugarcane fields. Later, in 1986, they held a strike to be paid by each meter, and not by each ton, of cut sugarcane. That was when they began to be registered as formal workers and to sign harvesting contracts. However, harvesting machines began to be used in the same period, although they were available before (Moraes, 2006, interview).

After the industry was deregulated, early in the 1990s, and the production of hydrated alcohol-fueled cars decreased dramatically, a very competitive market emerged for plant owners. This enhanced competition became a matter of survival. During this period, powerful economic groups began to promote conditions for more efficient companies to buy other plants. This transition affected workers directly, as they were forced to become more efficient. The productivity of rural cutters increased from cutting from five to six tons of sugarcane a day to cutting twelve tons a day. In addition, competition among workers increased, as they wanted to be included in the list of "efficient cutters." As a result, some sugarcane cutters can cut up to twenty tons of sugarcane a day nowadays (Alves, 2006).

According to Moraes (2006), conditions today are much better than thirty years ago, although lodging and work load problems still prevail. There are about 200,000 migrant sugarcane cutters today; the youngest ones are from seventeen to eighteen years old and cutting sugarcane is their first job. They are excluded from society. When they arrive, they don't complain, because the situation in the plantations is better than in their places of origin, where they face utter neglect.

A remarkable achievement of sugarcane cutters was the passage of NR 31, a regulatory rule on safety and health in the workplace approved on March 3, 2005. Among other requirements, employers must now provide and inspect the use of personal safety equipment; they must also analyze, with the participation of the Comissão Interna de Prevenção de Acidentes no Trabalho Rural – CIPATR (*Internal Commission for the Prevention of Rural Occupational Accidents*), the causes of work-related accidents and diseases to prevent and eliminate any possibility of new cases. The regulatory rule also imposed joint liability on companies, employers, production cooperatives and rural partners in connection with legal obligations.

In the opinion of Alves (2006), working conditions vary from plant to plant and from one plantation to another. The market for plants is heterogeneous, offering different working conditions to workers. It is easy to confirm whether there are different soil declivity levels, whether a sugarcane variety of a specific plant is more likely to be "felled" and the many management systems adopted by companies. When declivity is high and there is felled sugarcane, cutting becomes harder and productivity, the main source of a worker's wage, decreases. In addition, there are often problems for measuring the harvested sugarcane, enhancing the super-exploitation of workers.

With regard to groups listed in stock exchanges, as mentioned above, companies are controlled by the Comissão de Valores Mobiliários - CVM (*Securities and Exchange Commission*), which acts as a regulatory agency. These companies begin to be more closely investigated by CVM, because they begin to represent a much higher number of shareholders; moreover, for these companies, preserving their image is a means to become well established in the market. According to CVM, "the issue of any bond or security is required to disseminate any events related to the expected return on investment," such as the number of fiscal infractions and labor liabilities which should be published in their balance sheet each fiscal year, as well as to submit safety certificates.

Early in the 1990s, in the state of São Paulo (the state marked by the highest technological level and which accounts for about 60% of production), about 30% of all workers were skilled workers (agricultural oversight and industrial area), 10% were semi-skilled workers (i.e. tractor drivers and regular drivers) and the remaining 60% were non-skilled workers (sugarcane sowing and harvesting and other industrial tasks). Each million ton of sugarcane required 2,200 direct jobs (1,600 of which in sugarcane production and 600 in processing); indirect jobs (production and equipment maintenance, chemical inputs and other activities) were estimated at 30% of direct jobs. Therefore, the industry employed 380,000 people

altogether in the state of São Paulo (Macedo, 2007).

Estimates for Brazil considered a much more intense use of labor per production unit in the northeast region; in some cases, it was thrice more intense. Altogether, 800,000 direct jobs and 250,000 indirect jobs were registered in 1990.

Late in the 1990s, the situation was assessed in a study based on the input-output matrix of the Brazilian economy (IBGE, 1997). Apart from direct and indirect jobs, this study made it possible to evaluate induced jobs. It showed that there were 654,000 direct jobs, 937,000 indirect jobs and 1.8 million induced jobs. It can be noticed that, although the production of sugarcane (and of end products) increased remarkably during the decade, the number of direct jobs dropped (as expected due to a higher concentration in the center-south region and to more intense mechanization and automation). Many activities were outsourced, increasing the percentage of indirect jobs significantly. Regional differences continued to influence jobs in the industry: although the north-northeast region accounted for only 18.6% of the domestic production, it concentrated 44.3% of the labor (that is, 3.5 times more labor per product unit).

Another relevant aspect for creating jobs and for its quality refers to the seasonality of agricultural activities. In Brazil, the climate and the agronomic features of sugarcane limit harvesting – the most labor-intensive operation of all – to six or seven months a year. The technology applied to agriculture determines the relative need for labor in two periods: the harvesting period and the period between harvests. High seasonality indices (defined as the ratio between labor in the harvesting season and in periods between harvests) require more temporary labor, leading to a higher turnover, training difficulties and, consequently, low wages.

Table 7 shows the evolution observed in the number of permanent and temporary workers in sugarcane production between 1992 and 2005.

It can be noticed that, throughout the period under consideration, there was little variation in the proportion between permanent and temporary workers. A greater participation of permanent workers was registered only in 1995, which was not maintained in the following years. On the other hand, the lowest relative participation of permanent workers was registered in 2003.

Table 8 shows data related to the evolution observed in the number of direct formal jobs in ethanol production in Brazil between 2000 and 2005.

It should be highlighted that the data shown in table 8 does not include jobs in sugar production activities both in agricultural tasks (sowing, harvesting and transportation) and in industrial tasks (processing and refinement). The difference between all formal jobs shown in table 8 (335,697 workers) and all permanent and temporary workers shown in table 7 (519,197 workers) is explained by the fact that workers in sugar production were not contemplated.

As regards direct formal jobs in agricultural activities, a variation can be noticed in the number of workers both in the north-northeast region and in the center-south region as a result of greater mechanization and automation. The net increase observed in the number of workers in the period under consideration was due to a significant expansion in areas planted with sugarcane in recent years, as already mentioned here.

Finally, it should be highlighted that degrading working conditions still prevail in sugarcane plantations in some places. In July 2007, inspectors of the Ministry of Labor, through the Mobile Group Against Slave Labor, found 1,108 sugarcane cutters working under degrading conditions in the city of Ulianópolis, 417 kilometers from the city of Belém, in a farm belonging to the Pará Pastoril e Agrícola S.A. company (PAGRISA), the largest ethanol producer in the state of Pará. Despite the evidence of slave labor, such as precarious lodging, inadequate food, diseases, extremely low wages (R$ 10 a month, as they were forced to pay for the food and medicines they consumed), the company denies having committed any crime.

Table 7
Evolution observed in the number of permanent and temporary workers in sugarcane production, 1992-2005

Years	Permanent		Temporary		Total
	Workers	%	Workers	%	
1992	368,684	54.7	305,946	45.3	674,630
1995	380,099	61.4	238,797	38.6	618,896
2001	222,418	53.6	192,671	46.4	415,089
2003	229,981	51.2	218,902	48.8	448,883
2005	293,631	56.6	225,568	43.4	519,197

Source: IBGE-PNAD, several years. Macedo (2007).

Table 8
Direct formal jobs, by producing region, in ethanol production in Brazil; 2000-2005

Sector	Region	2000	2002	2004	2005
Sugarcane (Agricultural area)	N-NE	43,031	42,301	51,362	50,247
	Center-South	146,171	137,832	139,072	157,087
	Total	189,202	180,133	190,434	207,334
Ethanol (Industrial area)	N-NE	25,730	28,244	26,342	31,829
	Center-South	42,408	66,856	80,815	96,534
	Total	68,138	95,100	107,157	128,363
Total		257,340	275,233	297,591	335,697

Source: Prepared by Macedo (2007) using RAIS-MTE data. Note: The data on employment in the agricultural sector (sowing, harvesting, transportation) were calculated from the total data on employment in the sugar and ethanol industries, taking into account the percentage of sugarcane used for producing ethanol each year.

1.7. International ethanol scenario

Brazil is seen as a major actor in the agrofuel industry. Today, the Brazilian producing capacity amounts to seventeen billion liters. According to a study carried out by BNDES, the country would need to produce an additional eight billion liters to meet its domestic demand. According to BNDES, Brazil can contribute decisively toward a target of replacing 10% of the gasoline being used in the world right now (220 billion liters). According to this study, if Brazil conquers 50% of the market, it will have to multiply its ethanol production by seven, to about 110 billion liters (*Folha of São Paulo* newspaper, 05/28/2007).

The data shown on table 9 show that Brazil is ranked among the main ethanol-producing countries and that it led the world production up till 2005, when it was exceeded by the United States, which produces ethanol from corn.

The diversity of raw materials being used for producing ethanol in the different producing countries imply the need to make a comparative assessment of the features of the production process with each of these raw materials.

One of the parameters that can be analyzed refers to the relation between the amount of fossil energy spent in all the ethanol production chain and the amount of renewable energy that is obtained. This figure is important to characterize the replacement of fossil fuel - how good the new fuel is as a substitute of fossil fuel. Productivity is another major parameter, and it is determined by the features of the raw material in relation to soil use and food and energy production.

Table 10 shows data for these two parameters for the different raw materials that are used for producing ethanol.

It shows that sugarcane stands out for its productivity in relation to the other raw materials, but also, and mainly, for the significant proportion between the renewable energy that is obtained and the fossil energy that is spent.

Table 11 shows in detail the base for calculating the amount of fossil energy spent in the different steps involved in producing ethanol from sugarcane and the amount of renewable energy resulting from the process, both for ethanol and surplus sugarcane bagasse, as well as the surplus electricity.

Other data related to producing ethanol from sugarcane as compared to the other raw materials should also be highlighted. In terms of carbon dioxide emissions, in the case of ethanol from sugarcane the figure is 0.4 t of equivalent CO_2 per cubic meter of anhydrous ethanol; in ethanol from corn it is 1.9 t of equivalent CO_2 per cubic meter. The costs for producing ethanol

Table 9
Main ethanol-producing countries (in billions of liters)

Year	1997	2000	2003	2005
Brazil	15.49	10.61	14.73	16.00
US	5.89	6.47	10.90	16.14
China	2.69	2.97	3.40	3.80
India	1.65	1.72	1.90	1.70
Other countries	7.24	8.02	9.05	8.25
Total	32.96	29.79	39.98	45.89

Source: F. O. Licht's - World Ethanol & Biofuels Report, 2006.

Table 10
Energy balance in ethanol production using various raw materials

Raw materials	Renewable energy / fossil energy used	Productivity (liters/ha)
Ethanol from corn (US)	1.3-1.6	4,700
Ethanol from sugarcane (Brazil)	8.9	7,000
Ethanol from sugar beet (Germany)	2.0	1,600
Ethanol from saccharine sorghum (Africa)	4.0	1,100
Ethanol from wheat (Europe)	2.0	1,100
Ethanol from manioc	1.0	4,900

Source: Macedo (2007); Machado (2007).

Table 11
Energy flows in sugarcane and ethanol production (in MJ/t sugarcane, 2005)

Sugarcane production/transportation	182.3
Processing into ethanol	43.2
Fossil energy used (total)	225.4
Energy in the produced ethanol	1,897.4
Energy in the surplus bagasse	95.3
Electricity surplus	10.8
Renewable energy produced (total)	2,012.4
Renewable energy produced/fossil energy used	
Ethanol + bagasse	8.8
Ethanol + bagasse + electricity	8.9

Note: The figure for the electricity surplus is 2.1 kWh/t of sugarcane.
For this calculation, the fuel required by a thermoelectric plant with a 40% efficiency natural gas combined cycle was considered.

Source: Macedo (2007).

from sugarcane in Brazil range from US$ 0.20 to US$ 0.25 per liter; the costs evaluated for ethanol from corn in the United States amount to US$ 0.33 per liter; for ethanol from wheat in Europe they amount to US$ 0.48 per liter; and for ethanol from sugar beet in Europe they can be as high as US$ 0.52 per liter.

It can be seen, therefore, that in all the parameters that were considered, ethanol from sugarcane produced in Brazil offers the highest comparative advantages.

1.7.1. The Brazil-US agreement

In March 2007, the president of the United States, George W. Bush, visited Brazil; late in that same month, the Brazilian president visited Bush in Washington.

During their first meeting, they signed a memorandum of understanding between the two governments expressing "the intention to cooperate in developing and disseminating biofuels following a three-level strategy (bilateral, in third countries, and global)". At the bilateral level, the idea is to "promote technological research and development for new-generation biofuels." In relation to third countries, "the participants intend to work together to extend the benefits provided by biofuels" to them and, in particular, to stimulate their production and consumption in Central America and the Caribbean. Finally, at the global level, "the participants wish to expand the biofuel market through cooperation for establishing uniform standards and rules."

Since the agreement failed to establish a target for the cooperation, one should bear in mind the domestic targets set by the US for increasing the use of ethanol to ponder its consequences for Brazil.

In the United States, the prices of agricultural products are being pressured by a high demand for lands for producing agrofuels, according to a report of the United Nations Food and Agriculture Organization (FAO) and the Organization for Economic Cooperation and Development (OECD).

The authors of the study say that structural changes, such as a higher demand for raw materials for producing agrofuels and fewer surpluses as a result of reforms in the agricultural industry, can keep prices above historically balanced levels over the next ten years. It is anticipated that substantial amounts of corn in the US, wheat in the European Union and sugar in Brazil will be used for producing ethanol and biodiesel.

The case of corn, the main raw material used for feeding animals, is paradigmatic. According to OECD and FAO rapporteurs, it is estimated that 86 million tons of corn will be necessary for producing ethanol between 2007 and 2008 in the United States alone. That is, 60% more (thirty million tons) than the total used in the previous period. This figure is also higher than the total volume of world corn exports, estimated at 82 million tons. In the US, the annual amount of ethanol from corn is expected to double by 2016.

In the European Union, which produced 3.9 million tons of agrofuels in 2005 (60% more than in 2004), the amount of grains required for producing agrofuels will increase from 10 million to 21 million tons by 2016.

Half of the raw materials used by the European Union to produce agrofuels comes from Brazil, which exported 50% of the 538,000 tons of soybean and palm oil used by the EU for this purpose.

In January of this year, in a speech to the US Congress, Bush proposed a target for reducing gasoline consumption by 20% over a ten-year period. This target would be basically achieved by increasing the efficiency of cars - the White House estimated an efficiency of 4% a year - and by partly replacing gasoline with ethanol. The president mainly used a geopolitical argument; this would lead to a reduction of 75% in crude oil imported from the Middle East. In the same speech, Bush asked Congress to raise the mandatory standard set for the production of alternative fuels to 30 billion liters by 2012 and to 130 billion liters by 2017.

Even using its full agricultural potential for producing corn, with the technology available today the US ethanol-producing capacity would amount to only 15% of the target set for 2017 and 5% of it would have to be ensured though imports. Regardless of this daring target, the project proposes that the fuels should be produced by the US. Today, a tariff of US$ 0.14 is charged for each liter of ethanol exported from Brazil. Under US laws, this level will be maintained at least until 2009.

Besides the US, Brazil has been holding negotiations with other countries, such as Japan, with which it is negotiating higher ethanol sales. According to calculations made by PETROBRAS, if the Japanese government decided to mix ethanol to the gasoline consumed in the country at a proportion of 10%, 6.5 billion liters per year would be necessary to meet the demand (*Agência Brasil* news agency, 08/28/2006).

1.7.2. European Union

Recently, the European Council pledged to reduce all greenhouse effect gas emissions by at least 20% in relation to 1990 by 2020. Two targets were established: a 20% participation of renewable energy in relation to the total energy consumption in the European Union and a 10% participation of agrofuels in the consumption of gasoline and diesel oil used in transportation in the European Union by 2020, which will amount to an annual volume of approximately 13 billion liters of ethanol.

Box 2
Policies for stimulating the use of agrofuels in countries of the European Union

Germany	Pure biodiesel exempted from fuel taxes from 2004 on. An up to 5% mixture of agrofuel to gasoline would enjoy a reduction in domestic taxes of up to 0.47 euros per liter of added agrofuel.
United Kingdom	Subsidy of 0.33 euros per liter for biodiesel and ethanol. However, this subsidy will remain available until 2007. A governmental plan for building a pilot plant was also approved.
France	The volume to be subsidized will begin to be adjusted on a yearly basis, but the price of agrofuels will always be similar to the price of traditional fuels. Biodiesel prices will continue to range between 0.33 and 0.36 euros per liter. However, tax reduction in this country will be based on a quota to be adjusted from time to time.
Austria	An up to 2% mixture of biodiesel to diesel is exempted from domestic mineral fuel taxes. When mixed to agrofuel at a rate of 5%, gasoline will be subject to a reduction to be calculated.
Spain	For biodiesel, the reduction is of 0.29 euros per liter.
Poland	Domestic tariff reduction for ethanol. Between 2% and 5%, the exemption amounts to 0.45 euros. In the range of 5% to 10%, the exemption amounts to 0.54 euros. Above 10%, it amounts to 0.66 euros.
Italy	Domestic tax exemption per liter of biodiesel between 0.40 and 0.48 euros, but with a limited quota.
Sweden	Exemption from domestic taxes on carbon monoxide and from the energy tax until 2009.
Finland	Agrofuels are exempted from domestic taxes for tests and research.

Source: Renewable Fuels Association, 2006.

It can be seen that the European Union adopted an aggressive policy to increase its biodiesel-producing capacity, as shown in box 2. In Germany, 50% of all cars use diesel as fuel and are virtually prepared to have from 20% to 25% biodiesel mixed to conventional diesel. In France, 65% of all cars use diesel as fuel, leaving a vacuum for introducing agrofuel (Gue, 2006).

1.7.3. The responses of social movements in Brazil to agrofuels

The debate on the consequences of expanding the use of alternative fuels is becoming more intense because of growing controversies around the subject, particularly in relation to social and environmental problems in the country.

Various groups, organizations and networks have been denouncing the drastic consequences of this scenario for Brazil. Via Campesina, a network that includes, among others, the MST and

the Movimento de Atingidos por Barragens - MAB (*Movement of People Affected by Dams*), issued a note stating that the sugarcane industry has always been used as a tool for preserving colonialism "and structure of dominant classes, which control large tracts of land, industrial processes and commerce to this day."

According to a text prepared by Fidel Castro (2005), "capitalism is ready to promote a massive euthanasia of the poor, particularly of the poor in the South, where the largest biomass reserves of the planet, which are required for producing agrofuels, are located. Although authorities have been stressing in official speeches that it is not a matter of opting between food and fuels, reality shows that there is no other alternative: you either use the land to grow food crops or to produce agrofuels."

Others, however, see a unique opportunity to step up exports and generate foreign currencies and jobs in this scenario. The physicist Rogério Cezar de Cerqueira Leite, coordinator of the Ethanol Program, said that "only an extreme ecoparanoia can justify the fear that food crops will be suffering a drastic reduction and there will be widespread hunger in Brazil" (*Folha de São Paulo* newspaper, 04/15/2007).

Finally, it should be stressed that in a world where one billion people suffer chronic hunger and malnutrition (UN data) and 24,000 people die every day from causes related to these problems - among whom 18,000 children -, one should question whether the land available on the planet should be preferably used to meet the needs of 800 million car owners or to ensure food security in the world. Furthermore, one should question whether the South will continue to play the role of supplier of necessary raw materials for the North to preserve its consumption patterns (Carta Maior news agency, 03/02/2007).

1.8. Main challenges

This section addresses the main challenges involved in using ethylic alcohol as an energy alternative in our country with the aim of providing inputs to the debate and identifying controversies being discussed by social and environmental movements.

- *About expanding sugarcane plantations* – What tools and mechanisms are necessary to avoid the trend toward replacing other crops or expanding sugarcane plantations in environmentally fragile areas such as the *Pantanal* region in the state of Mato Grosso and the Amazon region?

- *About ethanol consumption* – In order to meet a growing domestic demand mfor ethanol as a result of the increasing numbers of flex *fuel* cars being manufactured, an additional eight billion liters will be necessary in 2010. Under what conditions should production be expanded?

- *About environmental problems related to water use and disposal of waste from alcohol distillation* – Can we say that these problems have been eliminated?

- *About environmental and public health problems caused by burning cane* – Should the laws in force in the state of São Paulo be applied to the country as a whole? Under what conditions should mechanized harvesting be stimulated?

- What criteria should be considered by BNDES to grant financings to the sugar/alcohol industry?
- Is the certification of agrofuels an effective tool? Under what conditions? Is it a mechanism that should be supported?
- How can the participation of family agriculture in the production of the sugar/alcohol industry be expanded? Is the Social Seal, which establishes purchase quotas to grant tax exemption, an effective tool?
- Is the Securities and Exchange Commission (CVM) an appropriate entity for public authorities to regulate the activities of sugar-alcohol-producing companies?
- Can bilateral agreements such as the one recently signed with the United States ensure benefits to Brazil? Under what conditions?

2. Biodiesel from soybeans, palm oil and castor bean

The hike in oil prices and environmental pressures, particularly in relation to climate change and its global consequences, led to a new perspective on agrofuels. Seen by certain people as the engine of Brazilian development due to its "comparative advantages" and the fact that Brazil masters this industry's technology and by others as something that will strongly contribute to food insecurity, agrofuels constitute an area requiring a comprehensive debate.

Biodiesel is a fuel produced from renewable sources that can be extracted from any vegetal matter whose raw material has sufficient oil content for this purpose. These include palm oil, babassu, soybeans, castor bean, sunflower, canola and cotton, among others. Biodiesel can be used pure or blended with diesel without any need to change the diesel engines of trucks, buses or cars or stationary engines used for different purposes. Table 12 identifies the potential of some oil seeds for producing biodiesel.

Table 12
Features of some vegetal species from which biodiesel can be produced

Species	Origin of the oil	Oil content (%)	Harvest months	Yield in oil (t/ha)
Palm oil (*Elaeis guineensis N.*)	Almond	26	12	3.0-6.0
Babassu (*Attalea speciosa M.*)	Almond	66	12	0.4-0.8
Sunflower (*Heleianthus annus*)	Grain	38-48	3	0.5-1.5
Canola (*Brassica camprestris*)	Grain	40-48	3	0.5-0.9
Castor bean (*Ricinus communis*)	Grain	43-45	3	0.5-1.0
Peanut (*Arachis ipogaea*)	Grain	40-50	3	0.6-0.8
Soybeans (*Glycine max*)	Grain	17	3	0.2-0.6
Pine seed (*Jatropha curca L.)*	Almond	52-62	24-48*	2.0-4.0

Source; Adapted from Macedo, Nogueira (2005); Arruda *et al.* (2004)
* The variation in harvest months is due to the origin of the plants, as those planted from seeds only become productive after four years, and those planted from seedlings begin to produce in the second year.

Brazil has all the necessary conditions to become a major biofuel producer, as it has incomparable potential for producing biomass for food, chemical and energy purposes. These conditions are favorable due to the country's huge territorial size and excellent edaphic-climatic conditions. Oil seeds such as castor bean, palm oil and soybeans can provide an abundant energy source and they have great strategic value for the Brazilian energy industry. In addition, they can be also be used as a social and economic inclusion tool, since the Brazilian government has plans to implement a family agriculture system for producing this new energy source.

2.1. Soybeans crops in Brazil

Agriculture is a major industry in Brazil and soybeans are its mainspring. Currently, soybeans account for a high percentage of Brazilian exports, and involve significant investments of domestic and external capital. According to data from the MAPA, Brazil is the second largest producer and main exporter of soybeans in the world today. In the 2005-2006 harvest, about 53 million tons were produced. In 2005, forty million tons (75.5% of the total production) were exported, with revenue of only US$ 9.28 billion.

According to estimates of the Confederação da Agricultura e Pecuária do Brasil – CNA (*Agriculture and Livestock Confederation of Brazil*) and of the Centro de Estudos Avançados em Economica Aplicada da Universidade de São Paulo – CEPEA/USP *(Center for Advanced Studies on Applied Economics of the University of São Paulo)*, each real (R$) generated in rural areas, generates R$ 2.56 in processing, transportation, and marketing.

The mid-west region is the main producing region, accounting for 50% of the production. The state of Mato Grosso accounts for 27% of the total domestic production. In the world, the US, Brazil, Argentina, China and India are the main producing countries. Together, these countries account for over 90% of the world soybean production.

Soybean is an oil seed grown by the Chinese since about 5,000 years ago. Its oldest variety, that of wild soybeans, grew mainly in low and wet lands in bulrush areas around lakes and rivers in Central China. This grain spread throughout Asia 3,000 years ago, where it began to be consumed as food. Early in the 20th century it began to be grown for commercial purposes in the United States, and its production grew rapidly as the first commercial crops began to be cultivated.

The first Japanese immigrants brought the grain to Brazil in 1908, but it was officially introduced in the state of Rio Grande do Sul in 1914. However, soybean crops began to be grown in Brazil in the 1970s, as a result of the interest of the oil industry and the demand for bran in the international market. Soybean oil is more used by the world population for preparing food products, while bran is widely used in animal feed. Flour, soap, cosmetics, resins, solvents and, now, agrofuels are other soybean by-products.

Soybeans have a consolidated agricultural potential. Despite their low percentage oil content (17%) as compared to other oil seeds such as peanut, canola and castor bean, they are grown in many parts of Brazil (Baruffi *et al*., 2007). Soybeans are typical of mild-climate countries, but they have been "tropicalized" and are now grown in various regions in Brazil. The yield in terms of soybean oil production is only from 0.2 to 0.6 tons per hectare. They also cause socio-environmental impacts as a result of slash-and-burn practices in Amazon forest areas to expand the planted area, which account for a high percentage of greenhouse effect gas emissions (about 75% of all emissions come from changes in land use).

Soybean crops are increasing in Mercosur countries (Brazil, Argentina, Paraguay and Uruguay), as well as the presence in them of large multinational corporations that market and industrialize soybeans, which can be felt in seed-producing areas and in financings for producing the grain. This is why soybean-processing industries have a great interest in participating in the

production of biodiesel. In 2005, there was a considerable idle capacity in the oil industry, which led companies to pressure the government to be awarded the Social Seal, since it ensures them many favors from the State: subsidies, tax exemption, financings with public funds and other benefits to speed up their inclusion in the National Biodiesel Production and Use Program (Schlesinger, 2006).

However, using soybeans for energy purposes involves many problems which are mainly related to the land framework for planting them. Their crops occupy large properties in rural areas in Brazil but they only account for a very small percentage of jobs in these areas, since they are cultivated under mechanized schemes based on the use of machines and fertilizers, reducing the need for rural labor. In addition, the area in which soybean crops have been growing have been directly or indirectly affecting biodiversity in the Amazon forest when they encroach on livestock areas and these in turn encroach on forests. Therefore, incentives to family agriculture and social inclusion in rural areas are not ensured with this type of occupation, which contributed to deforestation and to expanding the agricultural frontier.

Few soybean-producing companies had their production bought by the Agência Nacional de Petróleo, Gás Natural e Biocombustíveis - ANP *(Agency of National Petroleum, Natural Gas and Biofuels)* because only a small number of them have the Social Fuel *l*abel, since in most cases the production of this oleaginous plant hardly meets the criteria set for characterizing family agriculture, making it very difficult for them to be awarded the *l*abel (Bermann, 2007).

2.1.1. Soybean production evolution

Stimulated by a higher demand, mainly a higher international demand, soybean crops began to increase more vigorously in Brazil in the second half of the 1970s. This increase was mainly observed in states located in the south region of the country in areas traditionally occupied by agriculture, where soybean crops began to occupy areas in which other crops used to be grown or pasture areas. They began to be grown in the state of Rio Grande do Sul in rotation with wheat crops. After soybean crops were established in that state, they began to expand to the north, to the states of Santa Catarina, Paraná and São Paulo (Mueller, 2002).

Since the 1980s, they began to expand to the *cerrado* (savannah) region. Initially, the expansion of this crop in that region was not significant: about 15% of the area with soybeans was cultivated outside the south region and the state of São Paulo, this included the south of the state of Mato Grosso do Sul, the south of the state of Goiás and the so-called *Triângulo Mineiro* region (located in the state of Minas Gerais). Stimulated by development programs implemented by the government of the state of Minas Gerais, soybeans began to be grown in savannah areas of the *Triângulo Mineiro* and in the west of the state. Still incipiently, they also began to be grown in savannah areas located in the center and north of the state of Mato Grosso do Sul and in the southeast of the state of Mato Grosso (Mueller, 2002).

In 1990, the areas where soybean crops were concentrated formed a significantly large, continuous area in the central region of Brazil largely as a result of the expansion of agriculture in the country's *cerrado* region. The state of Mato Grosso was the third largest producer in Brazil in that year already, with about 1.6 million planted hectares. Soybean crops occupied large areas in almost all the state in that year, except for the Pantanal region, located in the western region of the state. This expansion was strongly influenced by natural conditions - which were considered unfavorable in the past - and by investments in technology, such as in genetic improvement, and in infrastructure. These investments enhanced the competitiveness of soybeans grown in the mid-west region, despite the higher transportation costs involved (Baruffi *et al.*, 2007).

Table 13 shows data for the evolution of soybean production, planted area and productivity in Brazil between 1990 and 2006.

Table 13
Evolution of soybean production, planted area and productivity in Brazil: 1990-2006

Harvest	Production (million t)	Planted area (million ha)	Productivity (kg/ha)
1990/91	15.39	9.7	1,580
1995/96	23.19	10.7	2,175
2000/01	38.43	14.0	2,751
2003/04	49.79	21.4	2,329
2005/06*	53.43	22.2	2,403

* Preliminary data
Source: MAPA - Annual Sugarcane and Agroenergy Balance, 2007.

An increase in soybean production and planted area was observed in Brazil. Production increased from 15.39 million tons in 1990-91 to 56.32 million tons in 2006-07, with a higher increase between 2001-02 and 2003-04, when it increased by 10.1 million tons or 19.42% in relation to the previous harvest.

In relation to the planted area, an increase of 9.7 million hectares in 1990-91 to 20.2 million hectares in 2006-07 was registered, mainly as a result of a higher production observed during the same period. The highest growth took place between 2001-02 and 2004-05, when an increase of 6.7 million hectares in the planted area was observed.

The states of Paraná, Mato Grosso and Mato Grosso do Sul are the main soybean producers in Brazil. Soybeans arrived in Brazil as a "modern" crop already, but the increasing use of technology and the development of varieties adapted to different ecosystems in the country, mainly by EMBRAPA and private seed companies, ensured a continued increase in the crop's yield.

Analyzing the distribution of soybean production by region, one sees that the south region accounted for 40% of the production in the 1990-91 period, which was particularly high in the states of Paraná (23%), the main producing state, and of Rio Grande do Sul (15%). The mid-west region accounted for 43% of the production and the states of Mato Grosso (17%) and Mato Grosso do Sul (15%) were the largest producers, while Goiás was the fifth largest producing state, accounting for 11% as a result of crops mainly grown in its east region. As for the remaining regions of Brazil, the southeast region accounted for 13% and the northeast region accounted for 4% of the production, while the percentage observed in the north region was insignificant.

Although they were not the region where the highest production rates were registered, the so-called mid-west areas (30%) were smaller than those occupied in the south region (57%). A higher productivity was also observed in the mid-west region, over 2,200 kilograms per hectare, with the northeast and southeast regions ranking second, with about 2,000 kilograms per hectare, while the south region was the one marked by the lowest productivity rates in the country (about 1,100 kilograms per hectare).

In the 2000-01 period, soybean production increased in all regions, except in the southeast, which accounted for 7% of the total production (a decrease of 5%). The north region, in turn, increased its participation, accounting for 1% of the total producing area. The mid-west region accounted for 45%, particularly the state of Mato Grosso, where production increased from 17% to 25% (an 8% growth), while producing areas in the states of Mato Grosso do Sul and Goiás accounted for 8% and 11%, respectively. The south region once again ranked second in terms of producing area, accounting for 42% (an increase of 2% in relation to 1990-91), particularly the states of Paraná, which accounted for 22% of the production, and of Rio Grande do Sul, whose contribution was 19%.

The state of Paraná, which was the largest producing state, lost this position to the state of Mato Grosso. In this same harvest, the participation of the south region in the total planted area decreased to 43%, while the participation of the mid-west region increased to 41%. Productivity in the south region increased to 2,718 kilograms per hectare, as a result of which it became the second most productive region, second only to the mid-west region, whose productivity also increased to 2,952 kilograms per hectare. The other regions also experienced an increase in productivity, but below 2,500 kilograms per hectare.

In the 2006-07 period, the mid-west region became the largest producing area (accounting for 47% of the total production in Brazil), particularly the state of Mato Grosso, where production once again rose to 27%, preserving its position as the largest producing state. Productivity in the south region dropped to 37% of the total Brazilian production; the states of Paraná (21%) and Rio Grande do Sul (14%) accounted for most of this percentage. The southeast region maintained its production level, accounting for 7%, and the northeast and north regions increased their participation to 7% and 2%, respectively.

Figure 4 illustrates soybean production in the 2006-07 harvest.

The area planted with soybeans increased in the mid-west region to 44%, representing an increase of 3% in relation to the 2000-01 period, and the south region experienced a decrease of 3% in its planted area and accounted for 40% of the country's total area. The other regions continued to concentrate less than 20% of the total planted area.

Recent data show that the state of Mato Grosso has about 6.1 million hectares planted with soybeans (MAPA, 2007), as a result of which it became the largest soybean producer in Brazil, outranking the state of Paraná. This rapid growth and spectacular territorial advance of soybean crops was induced and favored by technological developments ensured by agriculture/livestock research carried out in Brazil, which adapted soybean crops to tropical conditions (Arvor *et al.*, 2007).

Figure 5 illustrates the evolution of soybean productivity in the Brazilian regions.

It can be seen that soybean productivity has increased steadily in Brazil, particularly in the mid-west region, where productivity hit the mark of 2,941 kilograms per hectare in the 2006-07 harvests. The positive balance registered in this region, which in the 1990-91 harvests amounted to 2,263 kilograms per hectare, should be highlighted.

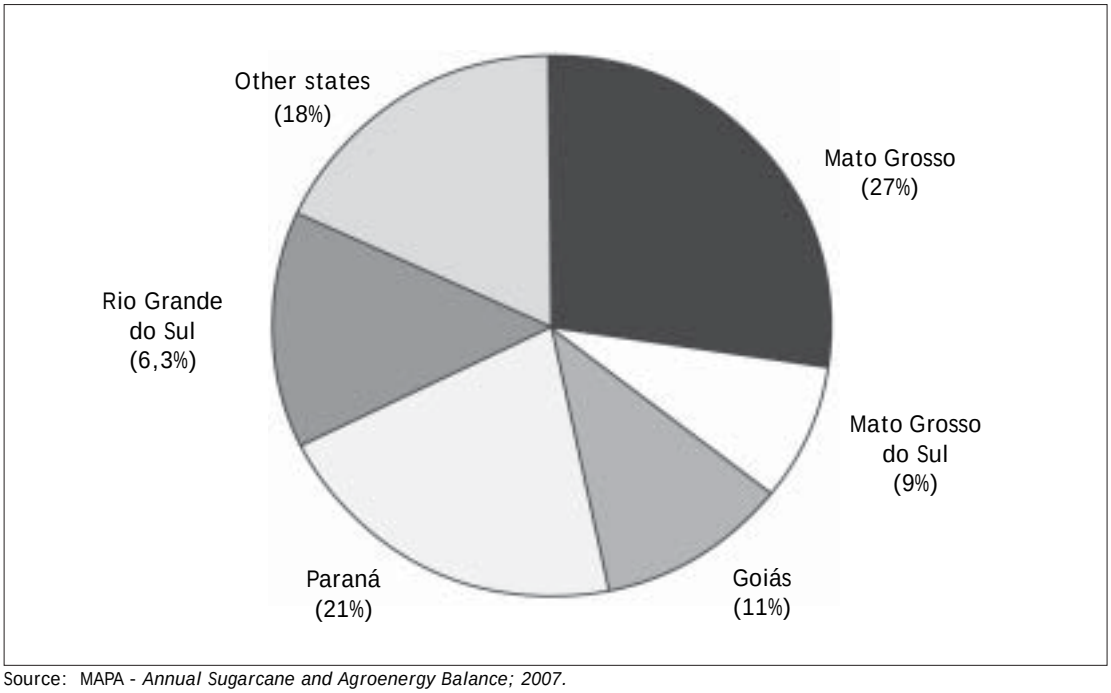
Productivity also increased during the same period, mainly as a result of better sowing techniques, such as using modified seeds, agricultural mechanization, use of fertilizers and high-precision agriculture, which led to an increase from 1,580 kilograms per hectare in 1990-91 to 2,736 kilograms per hectare in 2006-07. Between 2004-05 and 2006-07, productivity increased considerably, hitting the mark of 528 kilograms per hectare.

The recent performance of the mid-west region, where most soybean crops in the Cerrado biome are located, deserves special mention. The average registered in the region in the 2000-01 harvest was 2,845 kilograms per hectare, much above the national average; in this harvest, productivity in the state of Mato Grosso (3,050 kilograms per hectare) was the highest in the country, a fact that has been repeatedly registered in recent years. Actually, the technologies being applied to increase productivity and reduce costs have been playing a key role in making up for the high costs involved for transporting soybeans in the new *cerrado* zones (Mueller, 2002). Precision agriculture, which calculates productivity by square meters, facilitates the inclusion of fertilizers and nutrients in areas that are necessary for increasing productivity.

However, in the 2003-04 period, lower productivity rates were registered in the country, with rates ranging between 2,100 and 2,700 kilograms per hectare. The south region experienced the highest percentage growth: its productivity in 1990-91 was 1,224 kilograms per hectare and now it is 2,530 kilograms per hectare.

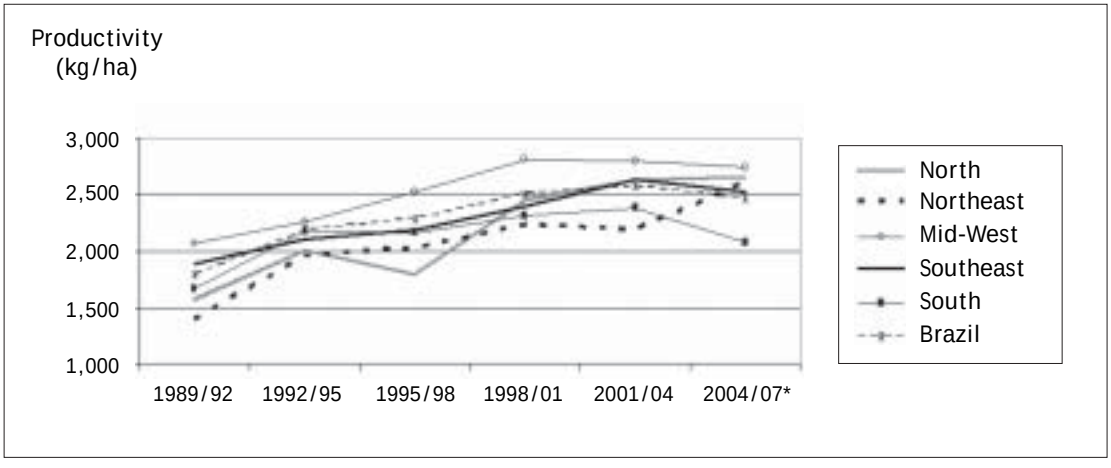
Considering the regions as a whole, a trend toward a relative homogenization of regional behaviors in relation to soybean productivity can be observed.

Figure 4
Distribution of soybean yield by state - 2006-07 harvest



Source: MAPA - *Annual Sugarcane and Agroenergy Balance; 2007.*

Figure 5
Soybean yield evolution according to the Brazilian regions in selected years



Source: MAPA - Annual Sugarcane and Agroenergy Balance, 2007.

2.1.2. Expansion of soybean crops and deforestation

In relation to soybean expansion areas, we can see that agriculture grew very rapidly in recent years: not less than 22.8% in planted area in only three agricultural years (2001-2002, 2002-2003 and 2003-2004). This recent expansion contradicts the pattern that prevailed during the 1990s, when the total planted area remained constant and production increased as a result of a higher productivity. Considering the three agricultural years from 2001 to 2004, a growth of 39.8% in the south and southeast regions and of 66.1% in the mid-west region was registered (Brandão, 2005).

In a survey carried out by the ISA/FBOMS Working Group on Forests in Mato Grosso, areas marked by the highest illegal deforestation rates in 2001, 2002 and 2003 were analyzed, as well as the evolution of soil use and the frequency of conversion from one use modality into another. According to a report prepared by Greenpeace (*Eating Up the Amazon,* 2006), 70,000 square kilometers of Amazon forest were destroyed between early 2002 and April 2006. In 2003 and 2004 alone, 27,000 square kilometers, an area equivalent to the size of Belgium, were destroyed, three-quarters of which illegally. This rate is equivalent to the destruction of an area as large as a soccer field at every eight seconds.

In 2004-2005, 1.2 million hectares were planted with soybeans in the Brazilian Amazon forest, representing about 5% of the total planted area in the country. Slash-and-burn deforestation accounts for 75% of all greenhouse-effect gas emissions.

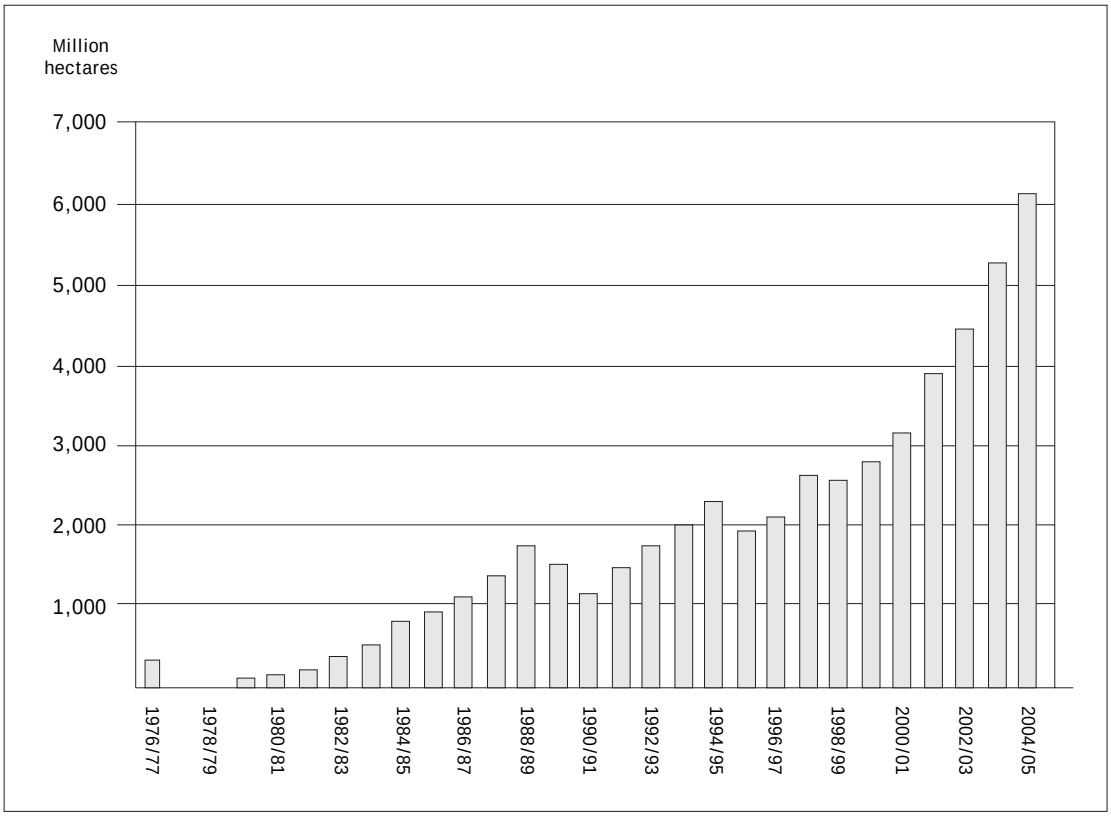
In the state of Mato Grosso, in Brazil's mid-west region, the area planted with soybeans increased by 400% in the past ten years. Crops began to be planted in central savannah regions and migrated about 500 kilometers to the north, displacing the agricultural frontier. Symmetrically, during the same period, the area that was deforested in the state increased by a similar proportion and progressively until the state government registered a percentage of 133% between 2002 and 2003. This is equivalent to a growth percentage of 6% in relation to the previous period, that is, about 26,130 square kilometers were deforested, most of which as a result of the increase observed in the area planted with soybeans (Schlesinger, 2006). About 90% of all soybean crops in the Amazon region are located in the state of Mato Grosso, where significant agricultural development was registered in the past thirty years. This huge tropical region is located to the south of the Amazon forest, where the natural vegetation is mostly arboreal savannah. However, the advance of the agricultural frontier to the north led to a rapid replacement of the natural vegetal cover by soybean crops, which became the main source of income in the state (Arvor *et al*., 2007).

The northwest region of Mato Grosso has large tracts of protected lands, traditional populations and rural settlements. This region has been suffering strong pressures from different economic interests, such as from mining, timber and livestock activities, causing conflicts with local populations and affecting the forest and its biodiversity. Areas located in the northwest region of the state are the ones marked by the highest population growth rates. The establishment of new rural centers largely leads this growth. The northwest region of Mato Grosso offers an alternative for absorbing a large amount of people engaged in land-related activities.

The cycle of crops in recently deforested areas is becoming shorter. This process is more evident in regions with a relatively consolidated agricultural frontier and access to infrastructure and a flat topography. There are signs that the period of approximately five years between deforestation and mechanization - as estimated by most observers - is being reduced to approximately two to three years. In 20% of the cases that were analyzed, this period was only one year (FBOMS/ISA, 2007).

According to information provided by Greenpeace, over one million hectares of forests were converted into soybean crops in the Amazon region, although studies showed that, because

Figure 6
Evolution of soybean production in state of Mato Grosso in the 1976-2005 period



Source; CONAB, January 2006.

of the fragility of the soil in the region, soybeans can only be grown on it for three years at most and suggested that the ground water in it has been contaminated by pesticides (Bermann, 2007).

The non-governmental organization Greenpeace Brazil observed that the soybean industry became a new actor in the "borders of destruction" of the forest in 2004 and identified four multinational companies in the area: Archer Daniels Midland (ADM), Bunge, Dreyfus and Cargill. These companies make up a soybean crushing monopoly in Europe, providing raw material to the feed industry. They are active in the supply side of almost all the production chain, involving from seeds and pesticides to infrastructure, ports and storehouses. Together, they fund about 60% of the total soybean production in Brazil.

Brazilians groups such as the André Maggi Group are also major actors in this industry. As governor of Mato Grosso, Blairo Maggi, the director of the André Maggi Group, set the target of doubling the agricultural production of the state in ten years. Other international financial actors also play a major role in funding crops.

According to an article called *Que fim levaram os fazendeiros*? (What happened to the farmers?) (2000), written by Brian Halweil, the transnational corporations mentioned above control soybean production in Brazil and are the main soybean processors and traders along the Mississipi river in the US and along the Paraguay and Paraná rivers in Brazil. The former is "the main path for marketing American soybeans in world markets" and the latter "flow in the middle of the emerging soybean region in Brazil."

These commodity companies lobby states to increase the infrastructure available along these rivers, arguing that this would enhance the competitiveness of farmers in the global market. However, this situation enhances the "confrontation" between Brazilian and American farmers, leading to an "expensive race to maximize production based on practices that degrade soils and undermine long-term investments." In practice, the companies which process, transport and market the grains are the ones that benefit most from this.

The author said that, as a result of the fiercer competition between farmers in the global market, soybean prices are depressed, reducing profit margins and generating less revenue per ton produced. Farmers are therefore "swallowed by large corporate farms, which can make up for their lower profit margins per ton by producing larger volumes." The author also showed that the industrialization of agriculture in the world reduced the profit margins of farmers and increased the profits of companies that produce agricultural inputs and market agricultural products. As a result, "many groups of companies were established which, through mergers, acquisitions and alliances with other links in the food chain, exert seamless and fully verticalized control over the food network, from genes to supermarket shelves."

This debate led to a special controversy when, in July 2005, the Instituto de Pesquisa Econômica Aplicada - IPEA (*Institute for Applied Economic Research*) issued a study called *Crescimento agrícola no Brasil no período 1999-2004: explosão da soja e da pecuária bovina e seu impacto sobre o meio ambiente* (Agricultural growth in Brazil in the 1999-2004 period: the soybean and livestock boom and its impacts on the environment). This document analyzes the factors that increased soybean production in Brazil. The main controversy was raised in a section called *A soja deve ser vista como amiga ou inimiga da floresta amazônica* (should soybeans be seen as friend or enemy of the Amazon forest)? This section states that soybean production increased in areas previously used for raising cattle. According to another theory, improvements in infrastructure in the Amazon region pushed land prices up and, as a result, led to a more rational use of the land and modernized agriculture in the north region, changing "prevailing activities in the region which can be blamed for predatory use of the forest: *a*) itinerant, low-technology agriculture which uses fire to clear areas; b) irrational timber exploitation; and *c*) cattle-raising of a low technical level which destroys natural resources."

This study led to an almost immediate response from the Working Group on Forests of the FBOMS, in a document jointly prepared with ISA, called *Relação entre cultivo de soja e desmatamento: compreendendo a dinâmica* (relation between soybean crops and deforestation: understanding the dynamic). The main theory of the study is that a higher soybean production is leading to widespread deforestation through the dynamic of clearing forest areas to implement cattle-raising schemes and, later on, mechanized agriculture systems. This speculative process expands the agricultural frontier. As a result of the increasing modernization of production, many workers are "excluded from these processes and tend to be displaced to marginal areas, where they open new movable borders or expand the reach of existing borders."

One of the consequences of expanding the agricultural frontier in the mid-west and north regions is concentration of the land, income and productive systems — large livestock farms and mechanized monoculture schemes, such as soybean crops —, subordinating the cultural and productive patterns of local and regional communities to patterns defined by new social actors, who are usually immigrants from other regions with capital and technology. Populations are displaced to cities as a result of the monoculture of soybeans through mechanization, the use of fertilizers and genetically improved seeds, and the expansion of large farms.

Large companies occupy spaces in rural areas that were occupied by diversified and family-based cultivation, reducing jobs and the capacity to produce traditional food products and jeopardizing the food security of the population. This process has displaced small settlers as a result of social conflicts or land purchases, driving settlers away.

Investments in infrastructure in the region, waterways, ports, storehouses and roads have stimulated

deforestation. About 85% of the deforestation occurs at a distance of fifty kilometers from a road. According to the same study, soybeans are the grains which employ fewer workers per area.

A partial analysis of limiting factors and stimuli for a future definition of scenarios for expanding soybean crops in the region showed that the main corridors available to market soybeans - Porto Velho-Itacoatiara and the Itaqui Port - become large areas along highways and vicinal roads susceptible to conversion into soybean cultivation areas. The zone of influence of the infrastructure is defined by the cost-difficulty ratio of the access to and economic return on the activity (ISA, 2007).

The largest areas which have been deforested already, but cannot be used for growing soybeans, are located in a 100 km area around roads in the northern region of the state of Mato Grosso, central region of the state of Rondônia, eastern region of the state of Pará, northern region of the state of Tocantins and southern region of the state of Maranhão. In the same zone of influence, the forest areas that are most susceptible to deforestation are located in a transition zone between savannah and forest areas mainly located in the southern region of the state of Rondônia and eastern and mid-west region of the state of Mato Grosso (ISA, 2007).

The study carried out by FBOMS/ISA suggests that soybeans are being grown in regions where cattle used to be raised in the past. In all steps of the deforestation process, property rights are ensured by the physical occupation of the land, a presence which is much more important than any tenure deed, encouraging the action of land grabbers or squatters.

However, as a result of this process, livestock is expanding the agricultural frontier. Based on statistical analyses, it was concluded that “deforestation rates are positively correlated (50%) to an increase in soybean crops and this correlation is extremely significant from a statistical point of view (probability of over 99%).”

Analyses of the correlation between the expansion of soybean crops and deforestation rates on a municipal scale show that there is an indirect relation between the two phenomena and suggest that soybeans are one of the factors leading to deforestation, but not the only one. There is evidence that their expansion brings deforestation to new areas and displaces livestock to other areas. In addition, future scenarios suggest that soybean crops will increase as a result of the availability of land and infrastructure.

There are elements suggesting that soybeans displace livestock to new areas, with a likely effect on additional deforestation. This is evinced by the reduction observed in the cattle population in the main soybean-producing municipalities and its increase in border areas, particularly, in the case of Mato Grosso, in municipalities located in the so-called movable border regions. In this state, different variables for quantifying this process were particularly analyzed.

In soybean expansion areas, the profitability of livestock and then changes made to the land or its sale for intensive agriculture purposes show that both for initial agents and for cattle-raisers deforesting and converting forests areas into pastures is profitable. If there were no profits, there would be no interest in appropriating or purchasing converted lands and deforestation would certainly be much less intense (ISA, 2007).

Changes in the Amazon region are strongly associated with socioeconomic development processes, as a result of which the territory is occupied in a disorderly fashion and without any planning. Studies should be carried out to provide a better understanding of the complex anthropic processes at work in terrestrial systems.

Changes in soil use and occupation can be perceived by identifying the actions of different actors involved in these processes: traditional populations, family farmers, traditional farmers, woodcutters and miners. The Amazon region is marked by a pronounced biogeographic heterogeneity and different forms of human occupation incorporated into the landscape based on different spatial patterns that can be associated to different occupation actors, types and cases (Costa *et al.*, 2007).

2.1.3. The participation of soybeans in the National Biodiesel Program

Soybeans are becoming one of the main oil seeds contemplated in the National Biodiesel Program, as it is a known fact that they are the best established crop in the Brazilian territory. However, they can contribute to fostering deeper changes in the country's geographic landscape, harming biodiversity and populations in rural areas.

Table 14 identifies companies, volumes bought through ANP and oil seeds used for producing biodiesel.

The significant participation of projects based on soybean crops (eleven) deserves special mention. Of the total volume that was bought, equivalent to 840,000 cubic meters, about 166,550 cubic meters correspond to the production of biodiesel from soybeans, which accounts for approximately 20% of the total.

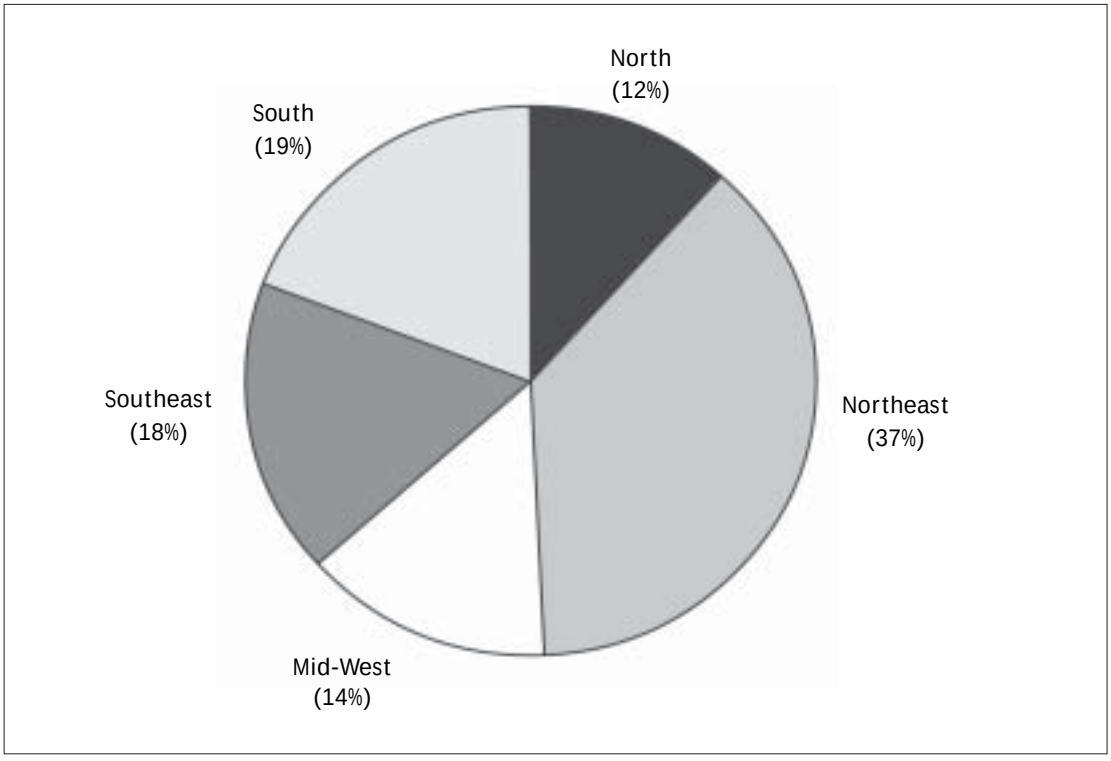
Many of the 23 winning companies belong to the same industrial complex. There are more participants in the southeast and mid-west regions, while the percentage of companies belonging

Table 14
Results of auctions held by ANP

Company and headquarters	Volume bought (m^3)	Oil seeds used
Agropalma - Belém (PA)	7,200	Palm oil
Agrosoja – Sorriso (MT)	5,000	Soybeans
Barrálcool - Barra dos Bugres (MT)	16,629	forage turnip, sunflower and pine
Binatural - Formosa (GO)	1,320	seedsunflower, forage turnip and pine
Biocapital – Charqueada (SP)	60,000	seed soybeans, sunflower, peanut, castor bean, forage turnip, pine seed
Biominas - Itatiaiuçu (MG)*	2,651	na
Brasil Biodiesel - Floriano (PI)	78,000	castor bean
Brasil Biodiesel - Crateús (CE)	90,000	castor bean
Brasil Biodiesel – Porto Nacional (TO)	90,000	castor bean
Brasil Biodiesel - Rosário do Sul (RS)	80,000	castor bean and sunflower
Brasil Biodiesel - São Luís (MA)	50,000	castor bean
Brasil Biodiesel - Itaquara/Morro do Chapéu (BA)	100,000	castor bean
Bsbios - Passo Fundo (RS)	70,000	soybeans, sunflower and canola
Caramuru - São Simão (GO)	30,000	soybeans, corn, sunflower and canola
Fertibom - Catanduva (SP)	6,000	pine seed, sunflower, castor bean, soybeans and peanut
Fiagril - Lucas do Rio Verde (MT)	27,500	soybeans (70%) and cattle fat (30%)
Granol - Campinas (SP)	20,100	soybeans
Granol - Anápolis (GO)	36,000	soybeans
Oleoplan - Veranópolis (RS)	10,000	soybeans
Ponte di Ferro - Rio de Janeiro (RJ)	31,000	cattle fat
Ponte di Ferro – Taubaté (SP)	19,000	soybeans
Renobrás - Dom Aquino (MT)	900	soybeans, sunflower and forage turnip
Soyminas – Cássia (MG)	8,700	soybeans
TOTAL	840,000	

Source: Bermann (2007), p. 47. Prepared based on information provided by ANP and companies.

Figure 7
Regional distribution by amount in volume



Source: Bermann (2007).

to the same industrial complex, such as Brasil Biodiesel, is higher in the north region and northeast regions. As mentioned above, this oleaginous plant hardly falls under the parameters of family agriculture in most cases and it is not exactly fit to be awarded the Social Fuel *l*abel, which was awarded to only eleven companies operating in the soybean industry.

All the auctions required the participating companies to have the Social Fuel label or at least that they had already filed an application to be awarded the label by the MDA. Until September 2006, only three companies had been awarded the label: Brasil Ecodiesel (owner of the Brasil Biodiesel projects), Agropalma and Soyminas. However, the latter was investigated by MDA and is losing the label because it submitted false information about products bought from family farmers.

The distribution of biodiesel supply among the winners in auctions can be seen in figure 7, which shows the distribution in percentages of volumes bought by region.

As can be seen, due to the requirement that companies must have the Social Fuel label to take part in the auctions, most of the bought volume comes from the northeast region (316,000 cubic meters of biodiesel, against only 97,200 cubic meters from the north region). However, although 38% of the volume was bought in the northeast region, this volume was supplied by a single company, namely, Brasil Biodiesel. This is not a positive fact, since it shows that the market might be concentrated in just a few producers. In addition, small farmers who grow oil seeds in that region may not be able to sell their production to any other company but Brasil Biodiesel (Bermann, 2007).

According to recent data provided by ANP, the biodiesel volume that was bought was distributed as shown in table 15.

Table 15
Authorized capacity of biodiesel-producing plants (2007)

Company	Location	Authorized Capacity (m^3/day)	Estimated Capacity[1] (10^3 m^3/year)	Company	Location	Authorized Capacity (m^3/day)	Estimated Capacity[1] (10 m^3/year)
Agropalma	Belem/PA	80	24	Caramuru	São Simão / GO	375	112.5
Agrosoja	Sorriso / MT	80	24	Dhaymers	Taboão da Serra/SP	26	7.8
Ambra	Varginha / MG	2.4	0.72	Fertibom	Catanduva/SP	40	12
Bsbios	Passo Fundo / RS	345	103.5	Frigol	Lençóis Paulistas / SP	40	12
Barralcóol	Barra do Bugres/MT	166.7	50	Fusermann	Barbacena/MG	30	9
Bertim	Lins / SP	333	99.9	Granol	Anápolis/GO	333.3	100
BioCamp	Campo Verde / MT	154	46.2	Granol	Campinas/SP	133	39.9
Biopar	Rolândia / PR	120	36	IBR	Simões Filho/BA	65	19.5
Biocapital	Charqueada/SP	186	55.8	Inovatti	Mairinque / SP	30	6.74(1)
Binatural	Formosa/GO	30	9	KGB	Sinop/MT	5	1.5
Biolix	Rolândia/PR	30	9	NUTEC	Fortaleza/CE	2.4	0.72
Biopetrosul	Taubaté/SP	213	63.9	Oleoplan	Veranópolis / RS	327	98.1
Brasil Ecodiesel	Floriano/PI	135	40.5	Ouro Verde	Rolim de Moura/RO	17	5.1
Brasil Ecodiesel	Crateús/CE	360	108	Ponte di Ferro	Taubaté/SP	90	27
Brasil Ecodiesel	Porto Nacional / TO	360	108	Ponte di Ferro	Manguinhos/RJ	160	48
Brasil Ecodiesel	São Luis / MA	360	108	Renobras	DomAquino/MT	20	6
Brasil Ecodiesel	Iraquara/BA	360	108	Soyminas	Cássia/MG	40	12
Brasil Ecodiesel	Rosário do Sul / RS	360	108	Usibio	Sinop / MT	20	6

[1]Annual capacity limited according to an environmental operation license in force.
Source: ANP, August 2007.

2.2. Castor bean crops in Brazil

Castor bean is known in Brazil as *pé de mamona* or *mamona*. This vegetal species, *Ricinus communis L*., is a plant of African-Asian origin that can be found throughout the Brazilian territory and is very common in vacant lots in urban areas, because it is easily adaptable to different soil and weather conditions.

The main subproduct of the fruit of this species is the seed, whose main product is castor oil. This oil is used for different purposes in popular medicine, as purgative and even in modern and technological applications, as it preserves its viscosity in a broad range of temperatures. It is also used as a base for biodiesel. The seed is toxic particularly because of a protein, ricin, which is deadly even in small doses.

Fortunately, it is difficult to digest the seed. However, more than three of them can kill a person. Its oil is used as raw material in unique applications of the chemical industry due to the unique features of its molecules: it is the only naturally hydroxilated vegetal oil and its composition is characterized by the prevalence of a single fatty acid, ricinoleic acid, which lends unusual chemical properties to it.

Castor bean adapts easily to different soil and weather conditions. In the northeast region, the miscegenation of varieties created spontaneous hybridism; the fruits are dehiscent, that is, they open up spontaneously, dropping the seeds and requiring multiple manual harvests every year. Although it is a tropical equatorial crop, its cultivation has been intensified out of the tropics and subtropics. In tropical and equatorial regions, arboreal species are usually grown; in subtropical and mild regions, the varieties are stunted and precocious.

Research carried out by EMBRAPA Algodão (cotton) in Campina Grande, in the state of Paraíba, suggests that castor bean crops are being rapidly expanded in Brazil to meet the demand for biodiesel, which is a market that is growing throughout the world and has the potential to ensure major benefits to the country: income generation in rural areas, less greenhouse effect-causing carbon gas emissions, less air pollution in cities and a stronger domestic economy as a result of foreign currency savings of diesel imports.

2.2.1. Evolution of castor bean production

Up to the end of the 1990s, castor beans played a very specific role in the oil seed production industry for making lubricant oils, cosmetics and chemical products. It should be mentioned that, in the late 1980s and early 1990s, Brazil was the world's largest castor bean producer. As a result of the search for new alternative electricity sources, mainly renewable sources, castor bean became one of the main research lines for future fuels.

Table 16 shows data on the evolution of castor bean in the 1990-2006 period in terms of production, planted area and productivity.

In relation to castor bean production in Brazil, data related to harvests before the period under consideration suggest that, in the 1977-78 harvest, the highest production was registered, 392.5 thousand tons. It can be seen, therefore, that more recent figures for production are almost three times lower than in the 1970s, revealing that this crop was abandoned, despite the recent production encouraged by the Biodiesel Program. This phenomenon was more pronounced during the 1990s, when production dropped to 37.5 thousand tons in the 1992-93 harvest, and the worst performance was registered in the 1978-79 harvest, 18.8 thousand tons.

Likewise, in relation to the evolution of the planted area, 485,000 hectares were planted with castor bean in the 1984-85 harvest, much more than in a more recent period. The 1977-78 harvest was characterized by the highest productivity, 1,141 kilograms per hectare. Although the increase observed in the planted area in the 2006-07 harvest reflects the effects of the

Table 16
Evolution of castor bean production, planted area and productivity in Brazil: 1990-2006

Harvest	Production (thousand t)	Planted Area (thousand ha)	Productivity (kg/ha)
1990/91	133.8	238.9	560
1995/96	47.6	121.5	392
2000/01	79.9	161.4	495
2003/04	107.3	166.2	646
2005/06*	103.9	147.9	703
2006/07**	152.3	209.1	728

* Preliminary data
** Projection
Source: MAPA - Annual Sugarcane and Agroenergy Balance, 2007.

Biodiesel Program and productivity tends to increase, the yield of castor bean crops is still low due to the low technological resources being used for them and to the virtual inexistence of inputs for its production.

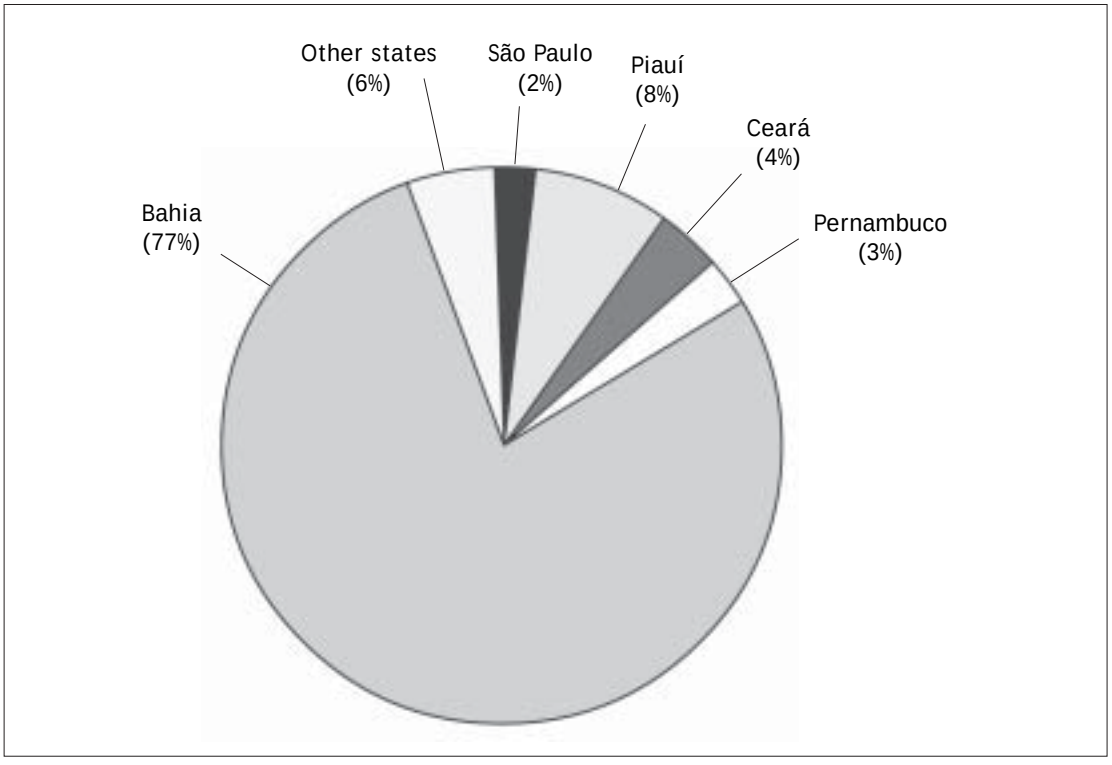
As shown in figure 8, the northeast region has always led the production of castor bean, with a participation ranging from 87% of the Brazilian area in the 1990-91 period to 92% in 2000-01, hitting the mark of 94% in 2006-07. The states of Bahia, which accounted for 53% of the planted area in the 1990-91 period, and Pernambuco, which accounted for 17% of the Brazilian production, stand out. In 2000-2001, 88% of the production was located in the state of Bahia; the other states accounted for no more than 5% of the total castor bean production. In 2006-2007, in turn, 77% of the castor bean production was located in the state of Bahia, followed by Piauí, with 8%. It is interesting to observe a decrease in production in the state of Pernambuco, which in the 2006-07 period accounted for only 3% of the Brazilian castor bean production, and in the state of Ceará, where it also decreased to 4%.

The southeast region is the second largest producing area, but its role is much more limited, ranging from 10% to 5% of the Brazilian area between the 1990-91 and 2006-07 harvests. Special mention should be made of the state of São Paulo, which nevertheless reduced its production from 10% to 2% in recent years. However, the highest productivity rates have always been registered in the southeast region, i.e. over 1,000 kilograms per hectare, while the rates in the northeast region range from 500 to 710 kilograms per hectare. Production in the remaining regions is either low or inexistent.

A series of studies carried out with various castor bean varieties revealed a high demand for research to improve its agricultural productivity and processing for producing oil. EMBRAPA Algodão (cotton) carried out different castor bean research projects and successfully managed to increase its productivity for farmers who grow this crop extensively.

One of the studies, on weight conversion factors, was aimed at estimating and validating factors allowing for the weight of seeds to be estimated based on the weight of castor bean bunches or fruits. In this research, samples collected in genetic improvement and mineral fertilization experiments were used. During the experiments, it was seen that the conversion factors differ between genotypes and levels (primary, secondary or tertiary), but are not influenced by chemical fertilizer doses. As the main result of these experiments, it was concluded that calculating the weight of castor bean seeds based on the weight of their bunch or fruits was a safe procedure, but the author observed that a factor should be calculated for each

Figure 8
Distribution of castor bean producing states in the 2005-06 harvest



Source: MAPA - Annual Sugarcane and Agroenergy Balance, 2007.

genotype, except those contemplated in the study, for which the factor had been calculated already (Severino *et al*., 2005).

Another study carried out in the premises of EMBRAPA Algodão was called "Behavior of castor bean under soil flooding conditions." It showed that the plants did not survive after being kept for four days under flooded conditions and those that were kept for three or four days under flooding began to grow again after the soil was drained, although not as much as others. However, some of these plants manage to survive for long periods even when grown under permanent flooded conditions (Severino *et al*., 2005the).

As a result of the interest in producing oil and biodiesel from castor bean, one sees that more up-to-date and localized agronomic information, allowing for the planted area and the profitability of the crop to be increased, is lacking. For this reason, a study called "Castor bean growth and productivity under chemical fertilization in the semi-arid region" was carried out by EMBRAPA Algodão in Campina Grande (state of Paraíba) for the purpose of testing nitrogen, phosphorous, potassium and micronutrients (boron, copper, iron, manganese and zinc) doses. A field experiment showed that productivity increased with fertilization; however, because of its high variation coefficient, the increase was not statistically significant. In the absence of fertilization, however, it was seen that the oil content of the seeds decreased. An increase in the number of bunches in response to a higher potassium dose was observed, although this increase was not reflected in yield (Severino *et al.*, 2005b).

If we consider the value of the product, castor beans can be a profitable agricultural option in arid and semi-arid regions in the northeast, regardless of its use for producing biodiesel. It can be mainly grown in small areas of approximately fifteen hectares each. If we consider a program

for replacing 1% of diesel oil based on castor bean, it would be necessary to multiply the current production by eight. In this case, it would be essential to strengthen the agricultural base with a larger number of varieties. This is theoretically possible, but at this level it would be a program more focused on meeting social needs than energy needs. The production model being proposed, that of "assisted" family agriculture in settlements should be appropriately assessed in its multiple aspects, with emphasis on total costs and income.

The CONAB showed, in February 2005, the results of the first survey of grain and cotton planting intentions. Among the grain varieties mentioned by CONAB, castor bean production stood out, which generated 2,489 tons on 3,111 hectares in the 2004 harvest. In the 2005 harvest, an increase of 10,489 tons on 13,111 hectares distributed among 28 zoned municipalities was observed. The government of Rio Grande do Norte invested in castor bean crops based on the belief that biodiesel is a safe and natural energy alternative right now, taking advantage of the opportunity to create another agricultural alternative for the semi-arid region and contributing to generate jobs and income in rural areas for family farmers and groups settled under the land reform program (CONAB, 2005).

Castor bean crops have been traditionally grown in Brazil by small and medium farmers, and they have a great social appeal; in the northeast region, for example, it is grown together with food crops, which because of the harsh weather conditions prevailing in that region are high-risk crops and, as a result, this oleaginous plant can ensure profitability in the area with a financial return because of its high adaptability and rusticity (Savy Filho *et al*, 1999).

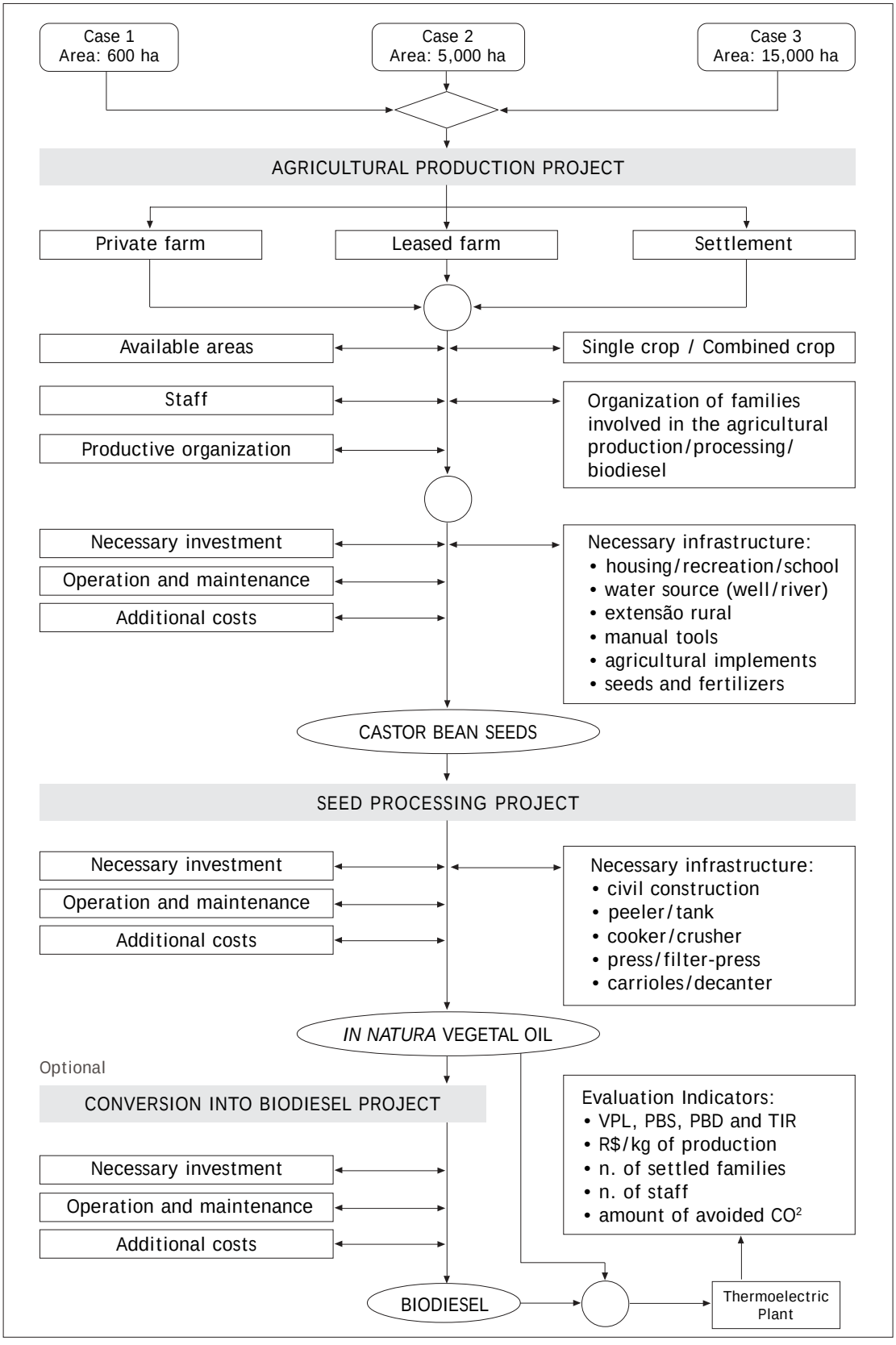
2.2.2. Participation of castor bean in the National Biodiesel Program

The data shown in table 14, which present the results of auctions held by ANP, reveal a very significant participation of castor bean in the program. A significant proportion of the biodiesel production of eight of the 23 auction-winning companies or projects is based on this oleaginous plant, accounting for approximately 458,000 cubic meters, which represent 55% of the total biodiesel production, 840,000 cubic meters. However, as mentioned above, most of the volume that was bought comes from the northeast region (316,000 cubic meters of biodiesel) and from a single company, Brasil Biodiesel, indicating that the market is concentrated in the hands of a few producers. In addition, small oil seed farmers in that region run the risk of not being able to sell their production to a company other than Brasil Biodiesel.

To meet the sustainable development needs of the electricity industry in the semi-arid region, a proposal was prepared in the form of an oil seed production chain model consisting of a sequential agricultural production process characterized as family agriculture, extraction of *in natura* vegetal oil from castor bean seeds and its conversion into biodiesel and, finally, application of mixtures of oils of vegetal origin added to fuels from thermoelectric power plants being used right now for electricity generation purposes. The results are turning into sustainable development factors from the economic, social and environmental point of view, as they are stimulating local economies, generating jobs and income for communities, keeping people in rural areas, minimizing greenhouse-effect gas emissions, generating renewable energy, etc.

In order to better understand the proposal to meet regional development needs in the semi-arid region, a functional scheme for the production chain logistics was developed which specifies all the details for using vegetal oils in the analyzed thermoelectric power plants. Figure 9 shows the production chain in the following steps: castor bean production; processing of its seeds; conversion of *in natura* vegetal oil into biodiesel (optional); preparation of the mixture at the desired proportions; and, finally, application in the analyzed thermoelectric power plants.

Figure 9
Functional demand of the production chain



2.3. Palm oil crops in Brazil

The species of the *Arecaceae (Palmae)* botanic family are popularly known as "palm trees." The most known species in Brazil, and one which is now being used for energy purposes, is found in the southern region of the state of Bahia and is grown in extensive plantations. It is being used currently for obtaining almond oil and pulp in large amounts to be used in cooking and industrial applications. However, it should be mentioned that this species is also grown in Brazil's north region and that it originally came from rain forests located in central and tropical Africa.

This palm tree is rustic and well adapted to the Brazilian tropical weather; however, it tolerates even winter frost in subtropical regions as an adult plant. It grows moderately and is tolerant to direct sunlight. The species can be found throughout the country, mainly in the northern and southern regions of the state of Bahia. It has ornamental features, as a result of which it can be planted in parks and large gardens, both in isolation and in large groups or rows.

It fructifies abundantly almost all year round, but particularly in the summer and fall. One kilogram contains about 92 ripe fruits and 181 seeds. It multiplies itself through seeds that germinate in about 270 days.

It should be highlighted that, beyond its use, solutions are also available for disposing of the end products and subproducts of the palm tree fruit.

Through experiments with lactating goats in lactation of the Saanen race, the feasibility of using palm oil cake in their diet was confirmed as an alternative whose nutritional balance varies from about 9.13% to 18.81% of the dry matter (Silva *et al.*, 2005).

The results presented by Silva (1997) in studies aimed at ensuring the feasibility of the alternative of generating electricity from palm oil in Guinea Bissau show that it can improve the structuring of the electricity industry in that country and also generate benefits for the local economy (through independent palm oil production in extensive plantations of genetically improved trees), besides environmental and social benefits. Two technological alternatives for generating electricity from palm oil were studied: one using *in natura* oil; and other using transesterified oil. As a result of his analysis, the author reached the conclusion that opportunities are available for generating revenue that could mitigate the weight of imports of oil by-products in the trade balance of that African country.

Dendê (palmoil) trees were introduced in shore areas in Brazil, initially in the region referred to as *Recôncavo Baiano* (in Bahia), where soil and weather conditions were favorable for its development. As demand for it increased, the need to improve the process for extracting its oil from manual to industrial was felt. The industrial process was followed by genetic improvements in its seed that led to the development of the *tenera* hybrid palm. Large commercial areas began to be planted using modern technologies developed by private corporations. Although large companies have their own plantations, they don't meet the needs for a full industrial production and they are forced to buy raw material from small farmers. The economic advantages afforded by them include job generation, decentralized generation, preservation of ecosystems, better income distribution and sustainable development (Torres, 2000).

Palm oil, extracted from dendê, has been playing a major role in the world production of oil and fat in recent years. The significant increase registered in the participation of this kind of oil in the global market confirms this fact. As compared to other oils, palm oil is the oleaginous industrial product with the greatest market potential in the near future. Table 17 compares alternatives in terms of oils and fat produced recently.

Table 17
World production of oils and fat

Oil	1997		2000		Growth (%) 2000/1997
	(million t)	(%)	(million t)	(%)	
Soybean oil	9.5	21.3	25.2	22.42	165.26
Palm oil	3.6	8.0	21.1	18.77	486.11

Source: SUFRAMA. *Potencialidades regionais - Estudo de viabilidade econômica - Dendê, 2003*.

2.3.1. Evolution of palm oil production

Currently, there are ten palm oil processing industries in Brazil whose total installed capacity is 241 tons of fresh fruit bunches per hour, as shown in table 18.

Based on of these data, an installed capacity of about 53,984 tons per month (241 t/hour x 8 hours/day x 28 working days) or 647.808 tons per year can be estimated.

Table 19 shows data on the evolution of palm oil production in Brazil in the 1995-2005 period.

The data show a significant production increase, from 75,000 tons in 1995 to 170,000 tons in 2005. The planted area has also been increasing since 2001, from 49.19 thousand hectares to 63.78 thousand hectares in 2005. The data also suggest a trend toward a higher production and an increase in areas planted with palm oil in coming years.

TABLE 18
Distribution of palm oil processing and installed capacity

Region/company	Installed Capacity (tons of of FFB/our)*	Municipality
Amapá	12	
1. Copalma	12	. . .
Amazonas	6	
2. Caiauê	6	Presidente Figueiredo
Bahia	44	
3. Oldesa	20	Nazaré
4. Jaguaripe	12	Muniz Ferreira
5. Opalma	12	Uma
Pará	179	
6. Agropalma	128	Tailândia Acará
7. Codenpa	15	Santa Isabel do Pará
8. Dentauá	12	Santo Antônio do Tauá
9. Palmasa	12	Igarapé-Açú
10. Marborges	12	Mojú
Total	241	

Source: AGROPALMA Group, 2000.
*Tons of fresh fruit bunches per hour.

TABLE 19
Evolution of palm oil production, planted area and productivity in Brazil; 1995-2005

Year	Production (thousand t)	Planted area (thousand ha)	Productivity[2] (kg/ha)
1995	75.0	-	-
2000	108.0	49.19[1]	2,196
2003	117.7	61.31	1,920
2005*	170.0	63.78	2,665

* Preliminary data
[1] Datum related to 2001
[2] Our calculation
Source: MAPA - Annual Sugarcane and Agroenergy Balance, 2007.
Data from PALMASA (company of the Association of Palm Oil Producers/state of Pará).

Although Brazil has geographical areas providing very favorable conditions for growing palm trees and for producing palm and palmist oil, its participation in this market is still incipient. The Brazilian oil production, which today amounts to about 115,000 tons a year, is less than 1% of the total production in Malaysia. At the world level, Brazil ranks 13th among producing countries; in Latin America, it ranks 3rd, behind Colombia and Ecuador. In fact, the area planted with palm oil in Brazil is insignificant in relation to its potential.

It should be observed that there is little information available on the geographic distribution of palm oil production. A study carried out by Agropalma in 2000 suggests that the potential for producing palm oil in the Amazon region amounts to about seventy million hectares, fifty million of which are located in the state of Amazonas. However, the planted area in this state amounted to only 1,200 hectares in 2000. Altogether, the area planted with palm oil in the Amazon region amounted to only 54,563 hectares, while the area used for production was smaller than 35,000 hectares. Among the Brazilian states, the state of Pará is the largest producer, accounting for approximately 85% of the palm oil produced in the country and for 0.6% of the global market, which amounted to 78,000 tons in 1999.

The socioeconomics of palm oil production in the state of Bahia has produced factors which restricted the expansion of palm oil plantations. This is due to the lack of a sectoral policy for the region, as exploitation has not yet become prominent and rational enough for promoting economic growth in the state based on palm oil plantations.

Another common situation faced in the region is caused by structural problems. Historically, the palm oil business in the state of Bahia has never relied on a sectoral policy to guide paths and actions for fostering its competitive development and consolidation. Even in the low south region, where this activity stands out in terms of volume and number of agroindustrial companies, there is no organized production chain yet. On the contrary, there are gaps in this chain's links both in terms of agricultural production and of processing and distribution. The bottlenecks of this agribusiness in all the state are directly related to the performance of the productive, agroindustrial and marketing sectors.

Among oil seeds, the productivity of palm oil is four to six tons per hectare. In the Amazon region, the state of Pará is the main producer. Palm oil began to be planted in it late in the 1960s and it has now become the country's main producer. The state of Bahia is the second largest producer in the country. Brazil's participation in the world production of palm oil amounted to only 0.53% in 1998, according to data from Oil World. In the processing of palm oil fruits, solid

waste is produced which can generate thermal or electric energy that can be consumed in the industrial unit itself or by rural communities. Palm oil can be used to generate mechanical and electrical energy; the fuel is used *in natura* in diesel engines and the oil is only filtered to eliminate suspended particles (Towers, 2000).

2.3.2. Participation of palm oil in the National Biodiesel Program

As can be seen in table 14, Agropalma is the only company that produces biodiesel from palm oil that has a contract with ANP; it participates with only 7,200 cubic meters of the total contracted volume, which is less than 1% of the total.

Regardless of biodiesel programs, palm oil deserves a lot of attention. The world palm oil production is expected to exceed that of soybeans by the end of this decade. Brazil accounts for only 0.5% of the world production, although it has the greatest potential in the world in terms of arable lands. An experience with "assisted" family agriculture is under way which should be appropriately assessed. The current supply of varieties is only appropriate for small production schemes. For palm oil plantations to be expanded for producing dende oil, more solid agronomic research is required. Some studies on biodiesel production carried out in Brazil suggest a relation of 1.4 in the case of soybeans; of approximately 5.6 in the case of palm oil; and of 4.2 for macaúba palm, confirming the potential for using palm trees as a source of raw material, that is, for ensuring a higher productivity and availability of waste which can be used for generating energy.

Palm oil is a highly productive oleaginous plant that can respond positively to the principles established by the National Biodiesel Production and Use Program. Incorporating family agriculture into the process of expanding palm oil production can be a path to be followed to consolidate the program and generate income in rural areas.

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Sérgio Vignes

CHAPTER IV

Report from presentations made and debates held during the Seminar

FIRST PART

Agrofuels from the perspective of the federal government

- The scenario
- The ethanol agenda
- The biodiesel agenda

SECOND PART

Agrofuels from the perspective of social movements and organizations and networks of Brazilian civil society

- Consensuses
- Topics to be further discussed
- Challenges

Introduction

This chapter is intended to register the main issues addressed during the seminar *Agrofuels and Family and Peasant Agriculture*, which was held on July 12-13, 2007 in Rio de Janeiro. It is not a transcription, since the event was not recorded, but rather a documentation of information provided through presentations and which came up in the different debates that were held during the event. This work was possible thanks to notes taken by devoted volunteers, to the presentations that were kindly made available by the speakers, and to the careful revision of the text by members of the Working Group on Agriculture of the Rede Brasileira pela Integração dos Povos - REBRIP (*Brazilian Network for the Integration of the Peoples*).

The chapter is divided into two parts. The first one address agrofuel related topics from the perspective of federal government organizations and Serviço de Apoio às Micro e Pequenas Empresas - SEBRAE (*Brazilian Service in Support of Micro and Small Companies*). The records refer to the presentations made by Carlos Gastaldoni, advisor to the Office of the President of the Banco Nacional de Desenvolvimento Econômico e Social – BNDES *(National Economic and Social Development Bank)*; Mozart de Queiroz, executive manager for Energy Development of PETROBRAS; by Laudemir Müller, head of the International Advisory Department of the Ministério do Desenvolvimento Agrário - MDA (*Ministry of Agrarian Development)*; Tereza Campello, deputy head of the Articulation and Monitoring Division of the Casa Civil da Presidência da República (*Presidential Staff Office)*[1] and Wang Ching, coordinator of SEBRAE's Agroenergy Portfolio.

It is our understanding that these organizations provided a comprehensive, albeit partial, vision of the governmental policy for agrofuels, because testimonials of important ministries on the topic are lacking, such as, for example, of the ministries of Agricultura, Pecuária e Abastecimento - MAPA (*Agriculture, Livestock and Supply*), Ciência e Tecnologia - MCT (*Science and Technology*), Minas e Energia – MME (*Energy and Mining*) and Meio Ambiente - MMA (*nvironment*). The challenge remains, therefore, to invite representatives from these organizations and others to attend a meeting in the near future. A decision was made to register only official information in this first part, leaving issues raised during the debates to be addressed in the second part. Therefore, this section is structured around three topics related to the governmental perception of the agrofuel scenario and of the ethanol and biodiesel agendas.

The second part compiles three sets of information: (i) presentations made by representatives of social movements, that is, of the Federação dos Trabalhadores da Agricultura Familiar - FETRAF (*Federation of Workers in Family Agriculture)*), Elizângela Araújo; of the Confederação Nacional dos Trabalhadores na Agricultura Familiar – CONTAG (*National Confederation of Agricultural Workers*), Antoninho Rovaris; and of the Movimento dos Trabalhadores Rurais Sem Terra - MST (*Landless Movement)*/Via Campesina, Wallace Medeiros; (ii) presentations made by representatives of networks, such as the Fórum Brasileiro de Segurança Alimentar e Nutricional - FBSAN (*Brazilian Food and Nutrition Security Forum*), Renato Maluf; of the Articulação Nacional de Agroecologia - ANA *(National Agroecology Articulation*), Jean Marc van der Weid; and of the Fórum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e o Desenvolvimento - FBOMS (*Brazilian Forum of NGOs and Social Movements for Environment and Development*), Artur Moreti and Hlemens Laschefski; and (iii) the results of the debates held during the seminar[2].

The text is structured around three topics: (i) consensuses: although each movement and organization has specific and unique positions, it was seen that different sectors of civil society

[1] It should be noticed that the representative of the Presidential Staff Office could not attend the seminar due to previous commitments. However, shortly after the event, she met with REBRIP's Working Group on Agriculture in Brasília to explain the governmental strategy for agrofuels. This information was considered extremely relevant for the purposes of this publication and, therefore, it was included in this documentation.

[2] The list of the organizations that attended the meeting can be found in the annex.

share similar positions and opinions in relation to a significant number of issues; (ii) topics to be further discussed, that is, those in relation to which different views and strategies were detected; and, finally, (iii) challenges facing the institutions that attended the seminar. The last section lists the proposals made during the event, which doesn't mean that they are necessarily consensual for all those who attended the seminar. This broad set of ideas can be used as a major input for defining the intervention strategies of each organization and social movement.

FIRST PART

Agrofuels from the perspective of the federal government

It should be stressed that this first part documents the presentations made by governmental representatives, with their respective argumentation line. All comments, deliberations and issues raised by the civil society organizations that attended the meeting can be found in the second part of this chapter.

1.1. The scenario

According to the federal government, biomass-related energy sources[3] are becoming increasingly important in the international scenario for the following reasons:

- Growth of the international economy, resulting in greater demand for more energy.
- Exhaustion of petroleum reserves.
- Political instability and armed conflicts in petroleum-producing regions.
- Costs for extracting petroleum on the rise, since petroleum beds are located in areas of increasingly difficult access.
- Significant hike in petroleum prices.
- Global warming, largely as a result of human activities and of intensive use of fossil fuels.

Given these circumstances, demand for agrofuels has been increasing significantly in the world. Developed countries have been particularly active in the search for lower-cost renewable energy alternatives using a greater diversity of raw materials, so as to reduce their dependence on petroleum and to be able to implement certain environmental measures[4].

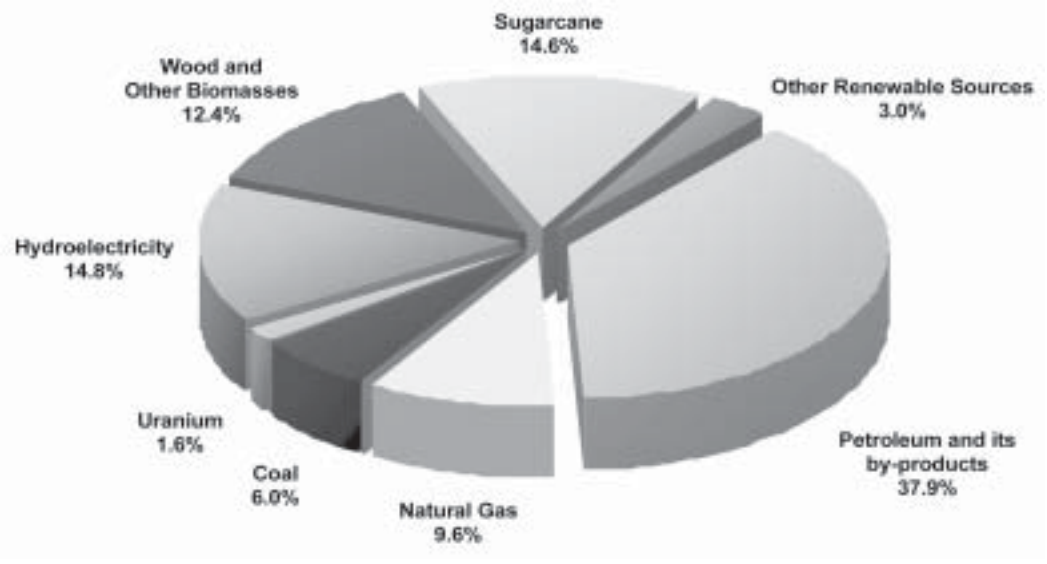
Today, agrofuels referred to as first-generation agrofuels are being used, such as ethanol[5]

[3] Vegetal or animal organic matter that can be used for energy production purposes.

[4] Many recent initiatives for this purpose stand out: (i) implementation of compulsory goals for the participation of renewable energy in the consumption of gasoline and diesel oil by developed countries (European Union, US and Japan). These measures will have an impact on domestic agrofuel production. (ii) Creation, in December 2005, of the Interamerican Ethanol Commission (IEC). Under private management, the Commission is coordinated by the following members: Jeb Bush (brother of George W. Bush), Roberto Rodrigues (former minister of Agriculture of Brazil) and Luis Alberto Moreno (president of the Inter-American Development Bank, IDB). The core objective of the IEC is to promote the production and global consumption of ethanol and other agrofuels. (iii) In March 2008, a Memorandum of Understanding between Brazil and United States was signed to increase their cooperation in agrofuels in three areas: scientific-technological cooperation in second-generation agrofuels: economic and financial feasibility studies in Central American and Caribbean countries: and definition of international standards and rules to turn ethanol into a commodity.

[5] Ethanol, also known as ethylic alcohol, is a substance obtained from sugar fermentation being used as fuel in (hydrated) alcohol-driven engines or mixed with gasoline (anhydrous) at a percentage of 22% in Brazil today.

Figure 1
Domestic energy matrix



Source: BEN, 2007.

and biodiesel[6]. However, research is under way in various parts of the planet for developing second- and third-generation agrofuels[7].

According to representatives of the federal government, Brazil enjoys a privileged position in this context not only because of its weather conditions and abundance of natural resources (water and land), but also because of its technological vanguard in all the agrofuel chain. Differently from the rest of the world, Brazil's energy matrix is such that 45% of its energy sources are renewable, a percentage that is three times higher than the world average, which is 14% (see figure 1).

Ethanol can be produced from sugarcane, sugar beet, sorghum, corn and manioc, among other sources. As opposed to biodiesel, ethanol is not legally regulated as a fuel in Brazil.

[6] Biodiesel is a fuel obtained from vegetal or animal raw materials. Vegetal raw materials are derived from plant oils, such as soybeans, castor bean, canola, sunflower, palm and peanut: those of animal origin are obtained from bovine, pork and poultry fat. Alternatives raw materials include oil used in frying. Biodiesel fully or partially replaces diesel oil from petroleum in automotive (trucks, tractors, vans, cars, etc), boat, train and stationary (electricity generators, etc) compression ignition engines. In Brazil, biodiesel is defined as a fuel in law 11,097/2005; for this reason, it is regulated by the Agência Nacional de Petróleo, Gás Natural e Biocombustíveis – ANP *(Agency of National Petroleum, Natural Gas and Biofuels)*.

[7] Researchers classify ethanol production technologies under three categories: (i) Ethanol produced from sugar fermentation, using sugarcane, corn, wheat or sorghum is first- generation ethanol; (ii) Ethanol produced from cellulose is second-generation ethanol. This type of agrofuel is obtained from agroindustrial waste (sugarcane bagasse, corn cobs, leaves, stems, wood chips). Therefore, besides enhancing the efficiency of the raw material that is used, it contributes to minimizing supply shortage threats for the food industry, considering that it is produced from subproducts. HBio also falls under this category: it is a national product created by PETROBRAS that consists in a new method for producing diesel oil from the processing of vegetal oil. It will be developed as an alternative to fossil diesel in coming years; (iii) Ethanol produced from gasified biomass and from synthesis reactions for producing liquid fuels is third-generation ethanol.

Given these facts, the government announced that it has the following challenges to face in defining public policies for energy:

- Increasing the participation of agrofuels in the energy matrix[8].
- Fostering energy security with as little external dependence as possible.
- Protecting the interests of customers through regulation and inspection.
- Protecting the environment.
- Fostering free competition.

For this purpose, taking advantage of what they see as huge comparative advantages available in Brazil, federal authorities are betting on the fast expansion of agrofuels to supply both the domestic and the international market. The Brazilian Government wants to make sure that Brazil will consolidate its leadership in the agroenergy industry not only in the area of agrofuels, but also in relation to bioelectricity. For this purpose, various initiatives are being implemented, such as, for example, the National Agroenergy Plan, which was launched in 2005 and is coordinated by the MAPA. This plan was designed to stimulate the agricultural production of biomass for energy generation purposes, ethanol, biodiesel, planted energy forests and the use of agricultural/wild/livestock residue[9]. As for ethanol and biodiesel, public authorities believe that they belong to two distinct agendas. Ethanol results from a consolidated and relatively deregulated market that is controlled by the private sector, particularly agribusiness. The biodiesel industry is in the process of structuring itself and relies on a strong intervention of the State, particularly through the National Biodiesel Production and Use Program (PNPB).

1.2. The ethanol agenda

Official data show that Brazil is the second largest ethanol producer in the world (about 17 billion liters in 2006-2007), second only to the United States (about 18.5 billion liters during the same period), and the main exporter of the product in the world (three billion liters in 2006-2007, amounting to 55% of all the ethanol traded internationally).

Brazilian ethanol is produced from sugarcane, which offers many comparative advantages in relation to other products (corn, sugar beet, sorghum, wheat and manioc), such as: (i) higher productivity[10]; (ii) higher energy efficiency, that is, better proportion between the renewable energy that is obtained and the fossil energy that is spent[11]; (iii) greater utilization of subproducts (for producing electricity from bagasse or fertilizers from vinasse); (iv) lower production costs[12]; and (v) greater versatility, since sugarcane is a raw material for many products other than ethanol, particularly sugar, but also sugarcane rum (*cachaça*) and products for the pharmaceutical and chemical industry.

Apart from being the most competitive country in the world in ethanol production, Brazil

[8] The energy matrix is a quantitative representation of the energy supply, that is, of the amount of energy resources offered by a country or region.
[9] Residue from planting systems that combine trees with agricultural or cattle-raising activities.
[10] For comparison purposes, the productivity of ethanol from corn in the United States is about 3,000 liters per hectare. In Brazil, this percentage is 6.8 thousand liters per hectare for ethanol from sugarcane.
[11] The energy balance of US corn is from 1.3 to 1.8. This means that for each unit of fossil energy spent in producing ethanol, from 1.3 to 1.8 units of renewable energy are produced. The energy balance of Brazilian sugarcane is 8.3.
[12] The production cost of American ethanol from corn was U$ 0.40 per liter in 2006-2007. In Brazil, this amount was US$ 0.20 for sugarcane.

has knowledge and experience in all the ethanol chain, as it developed, since the 1970s, one of the largest agrofuel programs in the world, based on sugarcane: the PROÁLCOOL program. Ethanol fuels the national fleet of automobiles through full or partial replacement of gasoline. As the pioneer in flex-fuel cars, which can be fueled by gasoline or ethanol simultaneously, in any percentage, Brazil has the largest fleet of cars of this kind in the world. Other vehicles also use ethanol as fuel. EMBRAER company is applying the ethanol technology to aircraft. Private corporations are already applying the flex-fuel concept to motorcycles.

According to the federal government, the experience accumulated in over thirty years, particularly in the field of science and technology, has resulted in advances, among which the following ones should be highlighted: (i) higher productivity, which doubled between 1975 and 2005, from about 3.2 thousand liters of ethanol per hectare to 6.8 thousand liters per hectare during that period; (ii) higher energy efficiency based on new sugarcane varieties; (iii) increased mechanization, avoiding the burning of sugarcane; (iv) lower water use, as a result of its reutilization in closed circuits and less sugarcane washing due to mechanization; (v) greater use of residue for producing organic fertilizers (from vinasse) and for generating energy[13]; and (vi) "carbon credits"[14].

Investments in the sector

For the purpose of fostering the growth of ethanol production, significant public funds are being allocated to this industry. PETROBRAS anticipates that, beginning in 2007, investments of US$ 1.6 billion will be made in the production, transportation, storage and distribution of ethanol. Other resources are being invested in research, in the so-called technological routes (second generation of agrofuels, utilization of residue, equipment, logistics). Moreover, for the purpose of promoting ethanol exports, alcohol pipelines are being built to connect Brazil's mid-west region to the Atlantic Ocean. As for the BNDES, disbursements for the agrofuel chain have doubled every year since 2004, and they will hit the mark of a little over R$ 2 billion in 2006. The bank's active portfolio includes 68 projects for implementing or modernizing ethanol plants, 21 projects for co-generating electricity from sugarcane bagasse, and shareholding in seven undertakings. Altogether, there are 96 approved projects under evaluation, involving financings in the order of R$ 11.3 billion.

An unprecedented initiative of PETROBRAS – a (small) bet on the integrated and diversified production of family agriculture

Although governmental efforts are in their absolute majority focused on agribusiness, it should be noticed that PETROBRAS is developing, in partnership with COOPERBIO, a small project for decentralized ethanol production integrated to the production of food products in the state of Rio Grande do Sul. This initiative involves 330 families of small farmers associated to the Cooperative (the families own up to two hectares each). Sugarcane, manioc and sweet potato

[13] According to data of the MME contained in the Energy Balance (BEN), sugarcane bagasse accounts for 1.8% of the electricity supplied in the country, apart from the electricity consumed by the sugarcane processing plants themselves, which in average amounts to 70% of the total generated energy.

[14] According to data of the MME, the use of ethanol avoided the emission of 644 million tons of CO^2 between 1970 and 2005.

are the raw materials used for producing ethanol. The food products that are produced are milk and leguminous plants (beans and peanut). COOPERBIO is also expected to produce fuel in microdistilleries that will be bought by the company PETROBRAS Distribuidora. Sugarcane byproducts will be used to feed livestock and as fertilizer. Additionally, seventy hectares of fuel forest are being planted (pine trees (*Jatropha curcas*), tung trees and eucalyptus) combined with oleaginous species.

Food and nutrition security

Among representatives of the federal government, the prevailing understanding seems to be that increasing sugarcane production would not threaten the food and nutrition security of Brazilians. The arguments mentioned to support this thesis are essentially two: the abundance of lands available in the country and production of renewable fuel from a plant that is of little relevance for feeding humans or animals. In the first case, it was mentioned that Brazil has about ninety million hectares for expanding agriculture. Currently, the area planted with sugarcane is only a bit larger than six million hectares, i.e. less than 1% of the national territory (851 million hectares). In addition, about thirty million hectares occupied with underutilized or degraded pastures could be released in coming years due to higher livestock productivity. Therefore, governmental representatives argue that a lot of space will be available for producing food products and agroenergy simultaneously. They also recall that the productivity of Brazilian agriculture has increased at a significantly fast pace, revealing its increasing efficiency. This situation is very different from the one experienced by first-world countries, whose croplands are saturated and where agriculture, of little competitiveness, survives at the expense of major governmental subsidies.

The second argument is that Brazilian ethanol is produced from a raw material that is not important for feeding humans or animals. Therefore, any increase in the price of ethanol would not have an impact on the diet of the population (lack of food products or higher food costs). And more: considering the changes taking place in the ethanol market, the Brazilian model would make it possible for sugarcane producers to replace the fuel with sugar, an area in which Brazil is also the world leader. Once again, Brazil's situation would be different than the one observed in other countries, where agrofuel production is in direct competition with food crops throughout its chain (such as with wheat and corn, for example).

The argument is that producing energy from vegetal mass involves more positive elements, as it would make it possible (i) to use a huge variety of plants for this purpose (native plants, which would adapt themselves to land not used for growing food crops) and (ii) to combine vegetal species, enhancing their potential to capture solar energy, thereby reducing the need to use traditional chemical fertilizers.

Environment and working conditions

Official authorities believe that the expansion of sugarcane plantations doesn't threat the environment. In addition to the fact that Brazil has one of the "strictest environmental laws in the world", the absolute majority of the country's sugarcane plantations are located in regions that are distant from the agricultural frontier and close to large consuming centers (center-south region and the so-called *Zona da Mata* in the northeast), because of increasing transportation costs. They also say that the Amazon region would not be used for growing sugarcane, since the varieties known so far are not adaptable to its weather conditions.

As for the issue of labor in the sugar/alcohol industry, the government believes that "advances

have been made" as a result of the formalization of much of the labor in this area and of other measures taken to improve the living conditions of sugarcane cutters particularly. However, it recognizes that "more measures are required."

Governmental authorities stress that some mechanisms are being implemented to expand the sugarcane agroindustry in a more sustainable way. One of them is the agroecological zoning of sugarcane plantations at national level. This zoning aims to produce maps with analyses and descriptions of the potential for planting the main sugarcane varieties. They involve four sets of maps aimed at identifying: (i) areas where sugarcane is already being grown and ethanol is being produced; (ii) regions whose agroclimatic features are appropriate for growing sugarcane; (iii) areas with environmental or legal restrictions, which are to be preserved and not used for agricultural production purposes, particularly the Amazon biome: and (iv) regions where incentives will be provided for growing sugarcane.

In addition, a Socioenvironmental Label is being created for ethanol, which is sort of a "clean list" of entrepreneurs of the industry. This label will be awarded to farmers who comply with different requirements. In the environmental area, the criteria are the following ones: (i) licensing, absence of environmental liabilities, and environmentally responsible solutions; (ii) rational use of water and energy and sustainability of other natural resources; (iii) lower emission of polluting gases which cause the greenhouse effect: and (iv) preference for areas which have been occupied already, marked by low productivity or which are environmentally degraded. As for labor relations, the requirements are related to adhering to the national collective convention to formalize labor standards, abiding by the law, and ensuring appropriate food, lodging, health, safety and transportation conditions to workers, among others.

Foreigners' control of the sugar/alcohol industry

There are governmental sectors concerned with the increasing presence of transnational corporations in the chain as a whole, from production to trade, including infrastructure. Apart from not facilitating this type of foreign participation, the legal framework currently in force in the country makes it difficult to size it. Therefore, the exact magnitude of this phenomenon in the country is not known. According to public authorities, measures are being taken to deal with this issue.

Challenges

The federal government believes that the following challenges must be faced to promote sustained growth in ethanol production and exports:

- Preserving the environment and labor relations.
- Eliminating logistic and infrastructure shortcomings all along the production chain.
- Regulating and standardizing ethanol to turn it into a commodity.
- Developing and training human resources all along the production chain.
- Supporting the machinery and equipment industry to meet the volume of anticipated orders, including the exports of plants.
- Investing significant funds in science and technology to continue to be the world leader in the industry.
- Building partnerships and technical cooperation arrangements with other countries.

Considerations of the Ministry of Agrarian Development (MDA)

It should be highlighted that the MDA, concerned with promoting a land reform and strengthening family agriculture in the country, has been raising certain issues to be discussed within the federal administration, among which the following ones particularly: (i) the negative impact of the ethanol "rush" on land policies. The expansion of sugarcane plantations is pushing land prices up, affecting the land market in general and increasing land reform costs very much in the country; (ii) indirect threats to the food and nutrition security of the Brazilian population as a result of hikes in the prices of raw materials and of the fact that family farmers, the main producers of basic food products in Brazil, are being driven out of their lands; (iii) deregulation of the sector, which has not managed to impose limits on the foreigners' control of the sugar/alcohol industry or on its encroachment on environmental protection areas. Representatives of the MDA highlight that the expansion of sugarcane plantations is "pushing" other crops to the agricultural frontier, thereby contributing to the deforestation of regions such as the *Pantanal* and the Amazon regions; (iv) greater concentration of an already excessively concentrated industry. According to data of the MDA, plants own 70% of all the area occupied by sugarcane plantations (30,000 hectares in average). The remaining 30% are in the hands of 60,000 small and medium-size farmers (27.5 hectares in average); (v) serious labor and environmental problems are yet to be addressed; (vi) the arguments built around ethanol as a "clean energy" can be challenged in certain regards, since the main source of carbon dioxide emissions in Brazil is burn for deforesting areas, mainly in the Amazon and in the *cerrado* (savannah) regions. This environmental disaster can be largely blamed on agribusiness; (vii) problems resulting from sugarcane monoculture; and (viii) the likely use of non-trade barriers by importing countries, particularly first-world countries.

Alcohol in Brazil: summary

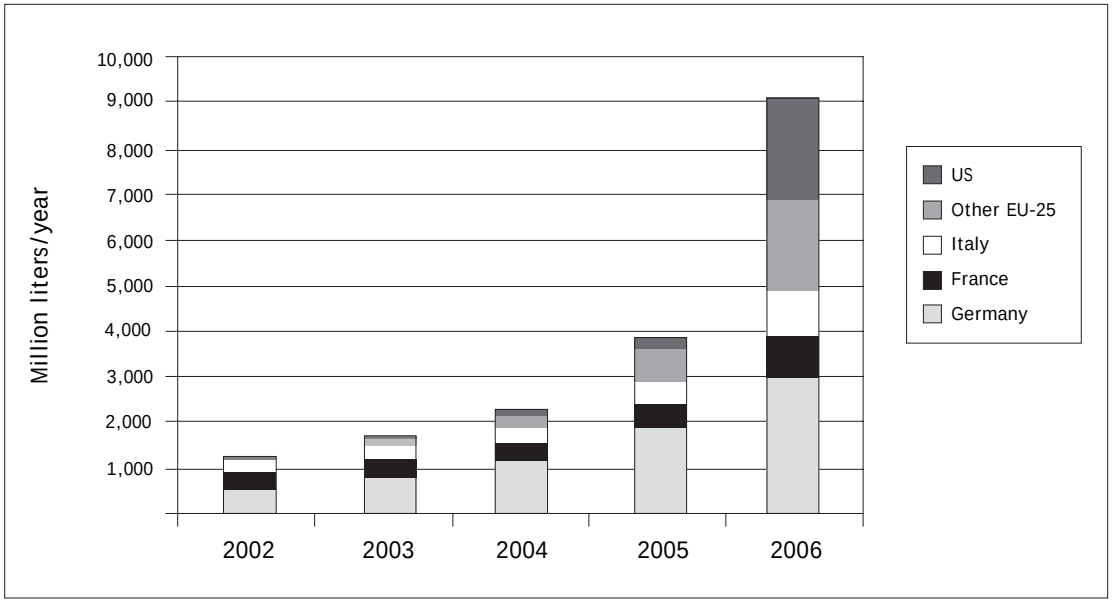
2006
■ Number of plants/distilleries: 355 ■ Production forecast: 18 million m^3 ■ Producing capacity: 20 million m^3 ■ Area used for producing ethanol: 3 million hectares (about half the area occupied by sugarcane plantations) ■ Exports in 2006: 3.4 million m^3 ■ Export infrastructure: 4 million m^3/year
2010
■ Investments of about US$ 8.6 billion in 77 plants (industrial and agricultural phase) ■ Alcohol production increased by 6 million m^3 (as compared to 2006) ■ Increase in sugarcane plantations for producing sugar and alcohol: 2 million hectares (only 0.2% of Brazil's area) ■ Expansion in the export infrastructure: reaching a capacity of 8 million m^3/year (PETROBRAS)

Source: MME, MAPA, Presidential Staff Office, 2007.

1.3. The biodiesel agenda

This is an industry in the process of being consolidated in the country. Brazil's role in the international scenario is still quite small. As shown in figure 2, the main biodiesel producers in the world are the United States and the European Union, particularly Germany. The Brazilian production is in the order of 850 million liters a year, less than 10% of the world production.

Figure 2
Biodiesel production in the world



Sources: European Biodiesel Board, National Biodiesel Board, Brasil Ecodiesel.

One can see, however, that the world production increased significantly in a very short time: it increased around nine-fold in only four years.

For the Brazilian Government, stimulating biodiesel production offers different advantages: (i) less dependence on fossil diesel. Although the country exports increasing gasoline surpluses, it still needs to import this fuel to supply domestic demand; (ii) better environmental conditions by improving the fossil-diesel burning process, as by mixing ethanol to gasoline; (iii) the possibility of strengthening family agriculture, including it in the biodiesel chain.

With the aim of fostering the expansion of this agrofuel, the federal government launched, in 2004, the Programa Nacional de Produção e Uso do Biodiesel – PNPB (*National Biodiesel Production and Use Program*). The program is coordinated by the Presidential Staff Office and involved fourteen ministries, besides ANP, PETROBRAS, EMBRAPA and BNDES. Under the PNPB, a number of joint initiatives will be implemented, among which the following ones stand out: (i) establishment of a regulatory framework for the new fuel; (ii) structuring of a technological base for biodiesel production; (iii) stimulus to the diversification of vegetal and animal raw materials; (iv) definition of financing lines; (v) organization of production chains: and (vi) design and implementation of a policy for involving family agriculture and settled groups in this agrofuel production chain.

Law n. 11,097/2005 provides that, as of January 2008, biodiesel is to be compulsory mixed to fossil diesel at a percentage of 2% (a scheme referred to as B2, with the mixture being successively increased until pure biodiesel can be used, called B100). In January 2013, this

percentage will be increased to 5% (B5). With the aim of ensuring a transition period to encourage the sector's structuring, the Conselho Nacional de Política Energética - CNPE (*National Energy Policy Council)* moved up the deadline to enforce this compulsory mixture provision to January 2006. The federal government estimates that Brazil needs to produce 840 million liters for B2 and 2.1 billion liters for B5 to comply with the legal requirements.

With respect to the intervention of the State to involve family agriculture and settled groups, the program was designed in such a way as to give special attention to poorer regions of the country, particularly to the north, northeast and semiarid regions. For this purpose, a set of tools was implemented, such as fiscal incentives, measures to buy production, funding and support to the organization of family farming schemes.

Tax incentives [15]

They provide for reductions in the aliquots of federal taxes and contributions such as PIS, PASEP and COFINS. These incentives are earmarked for companies that use castor or palm oil or even other raw materials, provided that small farmers produce them. The benefits are even

Table 1
Taxes applied to biodiesel and fossil diesel

BIODIESEL					FOSSIL DIESEL
Situations/ Fuel	Family Agriculture in the North, Northeast, and Semiarid regions, with castor bean or palm	Family Agriculture in General	Intensive Agriculture in the North, Northeast, and Semiarid regions, with castor bean or palm	General Rule	
REAL TAXES PER LITER OF FUEL					
CIDE*	Non-existent	Non-existent	Non-existent	Non-existent	0.07
PIS/PASEP COFINS	0.0	0.07	0.148	0.218	0.148
Sum of federal taxes	0.0	0.07	0.148	0.218	0.218
EXEMPTION PERCENTAGE IN RELATION TO FOSSIL DIESEL					
	-100%	-68%	-32%	0	

Source: MDA , 2007. * (Contribution for Intervention in the Economic Domain)

[15] In Brazil, the federal tax regime for fuels was defined by constitutional amendment nº 33 and by Law n. 10,336, which created the Contribuição de Intervenção no Domínio Econômico – CIDE *(Contribution for Intervention in the Economic Domain)*. These normative guidelines did not contemplate the possibility of biodiesel being available, so the application of this contribution to this fuel requires a new constitutional amendment.

greater if these raw materials are produced in the north, northeast and semiarid regions. The coefficients for reducing the aliquots are not homogeneous, as they vary according to the raw material and producing region. As can be seen in table 1, no tax incentives are provided as a general rule; in extreme cases, when private companies buy palm or castor beans produced by small farmers from the north, northeast, or semiarid regions, they are entitled to a 100% deduction from the PIS, PASEP and from COFINS.

Social Fuel Label

This label is awarded by the MDA to companies that, besides buying raw materials at prices agreed upon beforehand, provide technical assistance services to family farmers and support the organization of this segment. To be awarded the label, companies need to confirm this partnership and buy a minimum percentage of 50% of the raw materials they use from these farmers in the northeast and semiarid regions, 30% in the southeast and south regions, and 10% in the north and mid-west regions.

Being awarded the label provides the following advantages to companies: tax benefits, as described above, the possibility of taking part in public auctions for buying biodiesel and access to funding lines under privileged conditions.

Auctions

The public auctions held by ANP are aimed at stimulating this industry to structure itself. For this purpose, their objectives are the following ones: (i) increasing the participation of biodiesel in the domestic energy matrix; (ii) stimulating investments in the biodiesel production and trade chain; and (iii) making it possible for family agriculture and agribusiness to participate in the provision of raw materials in a combined fashion. Companies already established and which were awarded the Social Fuel Label can take part in them. Between November 2005 and February 2007, ANP held five auctions. The reference price at the opening of an auction is that

Table 2
Estimate of contracts based on five biodiesel auctions

	North	Northeast	Mid-West	Southeast	South	TOTAL
Contracts	5,730 (2.5%)	181,535 (80.7%)	8,184 (3.6%)	2,042 (0.9%)	27,486 (12.2%)	224,977 (100%)
Area (ha)	29,064 (5%)	363,070 (59%)	40,920 (7%)	47,923 (8%)	137,432 (22%)	618,408 (100%)
Biodiesel (million liters)						885
· Family						311 (35%)
· Other						574 (65%)

Source: MDA, 2007.

of diesel from petroleum, which in that period was R$ 1.9 a liter in average. PETROBRAS is the main purchaser of biodiesel.

According to estimates disseminated by the Ministry of Agrarian Development, about 225,000 contracts involving 885 million liters of biodiesel were negotiated. A little over one-third comes from family agriculture, as can be seen in table 2.

It should be observed, however, that soybeans continue to be the main raw material used for producing biodiesel in Brazil, since approximately 60% of this agrofuel is produced from that oleaginous plant, while about one-fourth is produced from castor bean and the rest from other raw materials, such as palm and sunflower.

The federal government believes that the results of the auctions show that, in a short period of time, biodiesel, which used to be seen as a purely experimental product, has become an actual energy alternative. Its production is still incipient, but ANP estimates suggest that the current installed capacity for producing it amounts to 1.2 billion liters a year already. These factors show that Brazil may adopt the strategy of moving up the deadline for compulsory B5.

Credit lines for the biodiesel chain

Public banks (BNDES, Banco do Brasil, Banco do Nordeste and Banco da Amazônia) offer credit lines focused on biodiesel production and trade comprising financings both for agricultural production and for the industry. In the case of family agriculture, resources can be obtained from PRONAF at interest rates between 1% to 4% a year. In addition, the federal government created the PRONAF Biodiesel program, through which family farmers can take more than one working capital loan to grow oil seeds before paying off the previous one. This measure is intended to allow family farmers to continue to grow food crops while growing oleaginous plant for producing biodiesel.

Other measures

As complementary measures, the following ones were mentioned: (i) creation of centers for producing raw materials for biodiesel production; (ii) progressive agricultural zoning (up to 2010) for the following oil seeds: castor beans, soybeans, sunflower, cotton, peanut, canola, dende and sesame; (iii) studies and research to identify new potential raw materials (such as pine seeds (*jatrofa curcas*)), new technological processes for producing oil, use of biodiesel in the automotive industry, combinations of food and oil seed crops, production of more appropriate equipment and utilization of subproducts (bran, cake, etc.), among others.

SEBRAE

SEBRAE seeks to encourage entrepreneurship. Its participation in the biodiesel chain is still small, but it is growing. Its agroenergy portfolio amounts to R$ 10 million today (2007-2009) to support seven projects in the states of Alagoas, Ceará, Minas Gerais, Mato Grosso do Sul and Piauí.

PETROBRAS

Representatives of the federal government believe that PETROBRAS has been playing a key role in increasing biodiesel production in the country. The company is the main purchaser

of this fuel in the market. It set up 5.5 thousand gas stations where the diesel/biodiesel mixture is available in 3,500 municipalities, in response to the need to organize the distribution of B2. As a result of its research lines, PETROBRAS has developed a technology to use vegetal oil or animal fat for purifying diesel from petroleum. This technology, known as HBio, constitutes another important means for including oils of vegetal and animal origin in the liquid fuel matrix.

Recently, PETROBRAS adopted the strategy of producing biodiesel. It is an experimental project that according to the company is being carried out in partnership with rural social movements (FETRAF, CONTAG, MST, MPA and MAB) and other cooperatives. The project is being implemented in three municipalities in the semiarid region with the following objectives: (i) buying raw material produced under family agriculture arrangements on a priority basis, stimulating the cultivation of different oil seeds in combination with food crops; (ii) encouraging family farmers to have their own crusher to supply oil to PETROBRAS and subproducts for other purposes. The project contemplates investments amounting to about R$ 227 million for assisting 70,000 families. This initiative also involves the governments of the states of Bahia, Ceará and Minas Gerais, EMBRAPA, Empresa Estadual de Assistência Técnica e Extensão Rural – EMATER (*Technical Assistance and Rural Extension Company*), Banco do Nordeste, Banco do Brasil and others organizations. Table 3 summarizes the main aspects of this initiative.

Table 3
Biodiesel industrial plants of PETROBRAS

Biodiesel plants	Candeias (state of Bahia)	Montes Claros (state of Minas Gerais)	Quixadá (state of Ceará)	TOTAL
Investment	R$ 78 million	R$ 73.4 million	R$ 76 million	R$ 227 million
Producing capacity	57 million liters/year	57 million liters/year	57 million liters/year	171 million liters/year
Inputs	Family agriculture: peanut dende castor bean Agribusiness: soybeans animal fat Residual oils (cooking oil)	Family agriculture: cotton castor bean Agribusiness: soybeans animal fat Residual oils (cooking oil)	Family agriculture: cotton sunflower castor bean Agribusiness: soybeans animal fat Residual oils (cooking oil)	
Family agriculture (jobsand income)	25,000 families	20,000 families	25,000 families	70,000 families
Jobs during construction	100 direct 400 indirect jobs	100 direct 400 indirect jobs	100 direct jobs 400 indirect jobs	300 direct jobs 1,200 indirect jobs

Source: PETROBRAS, 2007.

Challenges

The federal government believes that there is a favorable environment for investing in the biodiesel industry in Brazil (stable regulatory framework, fiscal incentives and funding). However, the sustained expansion of this chain faces the following challenges:

- Improving the public policy for including family agriculture and settled groups in the biodiesel chain.
- Enhancing agricultural efficiency.
- Ensuring the appropriate and necessary infrastructure.
- Improving and enhancing scientific and technological development.

SECOND PART

Agrofuels from the perspective of social movements and organizations and networks of Brazilian civil society

This second part documents, in general, the presentations made by social movements and networks of non-governmental organizations, as well as the comments, testimonials and suggestions made during the debates held at the seminar. The text is structured around three topics: common topics (or "unifying" topics, as highlighted by Jean Pierre Leroy in Chapter I): topics around which there are divergences, given the specific positions of the organizations: and, finally, challenges facing the agrofuel agenda for those who fight for an alternative development model to that of agribusiness.

2.1. Consensuses

The power and aggressiveness with which the agrofuel agenda is being imposed in Brazil

As a result of the global agroenergy "rush," family and peasant agriculture is being pressed from all sides to join the merry-go-round. These pressures come from multiple sources: the Brazilian Government, which wants to consolidate the Brazilian world leadership in this industry; the domestic agribusiness, which sees huge profit possibilities in the sector; transnational corporations and the international financial capital, which want to strengthen their hegemony; and the governments of developed countries, particularly of the United States and of the European Union, which need to renew their energy matrices by controlling their interests in regions which produce fuels of vegetal origin. They need to do so because these countries have no lands available to increase the production of food products and of agrofuels at the same time.

The agrofuel rush has resulted in daily announcements of billions of reals in both domestic and international investments in the chain as a whole, involving from the purchase of lands to the production of raw materials, including their industrialization, infrastructure expansion, and trade. This overwhelming and perverse process shows that a new energy model is being implemented that will deeply affect Brazil's sovereignty, food and nutrition security, and energy

sovereignty (expanded monoculture, greater labor exploitation, more exports of raw materials). This is a serious situation, as market interests dominate it and the federal government is not building a regulatory strategy to deal with it. The way agrofuel production is growing constitutes a neocolonization project in Brazil, a new attack of capital on peasant economies and on the country's food sovereignty.

The federal government says that biodiesel stimulates family and peasant agriculture while offering high fiscal incentives to biodiesel-producing companies. An additional aspect to be considered is that there is no agricultural policy designed to structure family and peasant agriculture. Given this scenario and the high interest of transnational corporations in the "promises" of a better future, we are witnessing the "integration" of family agriculture into biodiesel-producing companies, such as Brasil Ecodiesel, as mere suppliers of raw material. The pressure which family farmers and peasants have been suffering raises serious concerns and responsibilities for the organizations and movements that represent them. It is not simply a matter of denying and fighting the energy matrix. The situation is complex and requires careful and quick measures, as the steamroller is on its way.

The testimonials of rural social movements reveal that the participation of their constituencies in the sector is a growing reality. Although each movement has its own specific ways of dealing with the issue, actions such as training, technical advisory, support to production and development of alternative models to agribusiness (production diversification, combination with food crops, cooperation, agroecology, seed production) are under way. In addition, in one way or another, with more or less intensity, rural social movements are involved in the implementation of governmental programs or projects at the national, federal or municipal level.

Considering the speed and aggressiveness with which the agrofuel agenda is being established in Brazil, leaders of the movements, as well as civil society organizations dealing with the topic, believe that they should develop more detailed knowledge about it both to guide their constituencies and to challenge the model being imposed. As a matter of fact, another major consensus that emerged from the seminar was that the prevailing model is unacceptable.

The unacceptability of the model being imposed

There is a general understanding that Brazil is being included in the agrofuel agenda as agribusiness consolidates itself, and therefore at the expense of not only family and peasant agriculture but also of biodiversity, natural resources and human rights. Despite the official announcement that there are two distinct agendas (a business agenda, based on the market logic, and a social agenda, encouraged by public policies), what is actually happening in practice is that in both cases the prevailing model is the same: the agribusiness model, based on sugarcane monoculture, with regard to ethanol, and soybean crops, in relation to biodiesel.

There is also a general consensus that it is not correct to refer to fuel from vegetal raw materials as "clean and renewable." To deserve such qualifications, they could not have been produced under schemes involving deforestation, intensive use of pesticides and chemical fertilizers, irresponsible water consumption, significant use of polluting energy of fossil origin and the removal of farmers and rural workers from their lands for implementing monoculture schemes in large properties.

Therefore, the unacceptability of the prevailing agrofuel model is based on the following features:

a) Concentration of the land, income and power in the hands of agribusiness, due to the intensification of acquisitions and mergers of plants in the case of ethanol. Power is also concentrated in the biodiesel industry, particularly in the most profitable link of the chain: few companies dominate the process of industrializing fuel from oil seeds.

b) Higher land prices due to the agrofuel rush, making it difficult to implement the land reform, as expropriation costs rise considerably for the government. In addition, it contributes to drive family farmers and peasants out of rural areas, since they are forced to sell or lease their lands for lack of any other option.

c) Transnational companies have become more powerful in all the agrofuel chain. This is true for both ethanol and biodiesel. Foreign multinational companies are buying lands and investing quite heavily in producing raw materials, particularly sugarcane and soybeans, in industrialization and trading processes, and in infrastructure and equipment. In the case of biodiesel, it should be noticed that most of the capital of the company Brasil Ecodiesel, a leader in the production of this fuel, is foreign capital. Special attention should be given to second- and third-generation agrofuels, which seem to be dominated by patented technologies that will ensure greater strategic control on the evolution of the market to transnational companies.

d) Strengthening of agribusiness and expansion of sugarcane monoculture in the case of ethanol, and of soybeans, in the case of biodiesel. The negative impacts of this production model are well known, among which the following ones stand out: (i) higher urban and rural poverty rates, because in addition to driving family farmers out their lands, monoculture virtually generates no jobs. Without any other option, many peasants move to the outskirts of cities, enlarging extreme poverty pockets; (ii) more conflicts and violence in rural areas as a result of land disputes; (iii) contamination of the soil, rivers, ground water and springs, as a result of the use of chemical fertilizers and pesticides; (iv) destruction of biomes such as the Pantanal, *cerrado* and Amazon regions, owing to deforestation and burn practices; (v) depletion of one of the country's main assets, namely, freshwater, as a result of its intensive use, contamination and squandering; and (vi) the possible introduction and expansion of transgenic varieties. With the aim of illustrating the disastrous consequences of monoculture, the example of the municipality of Ribeirão Preto, in state of São Paulo, was mentioned, which is often referred to as the "Brazilian California" for its high technological development in sugarcane cultivation. Thirty years ago, this city produced all kinds of food products, had peasants in its rural area, was wealthy and was characterized by a more equitable income distribution. Today it is a huge sugarcane plantation, and some plants control all of its land. People moved out of rural areas in large numbers and the city is now full of slums. The prison population of Ribeirão Preto is larger than the population living off agriculture. This is the model of the sugarcane monoculture society: more people in prison than engaged in agricultural activities.

e) Reproduction of the agribusiness "integration" model. In general, the low participation of family and peasant agriculture in the agrofuel production process, particularly in the case of biodiesel, turns family farmers and peasants into mere suppliers of raw material or lands, which are leased to companies for manufacturing fuels from vegetal raw materials. This logic contributes to reproduce, once again, the excluding system of production chains such as those of milk, meat, tobacco, poultry and pork. There is another aggravating factor involved: the risk of decharacterization of family and peasant agriculture. As a matter of fact, when they sign a contract for supplying raw material to the industry, farmers assume the legal obligation to deliver the production volume agreed upon, or else they may suffer sanctions

and punishments under the law. This situation forces families to devote much more time to growing and processing these raw materials, relegating other crops grown in combination with them. This can lead to a super-specialization of the sector, to the detriment of the diversified production of food products, a historical activity of family farmers and peasants. In this process, the subordination of family agriculture to agribusiness is once again promoted. It was also mentioned that initiatives based on the commercial model proposed by SEBRAE could also contribute to decharacterize family and peasant agriculture, as it was exclusively designed to turn small farmers into entrepreneurs.

f) It threatens Brazil's sovereignty and food and nutrition security, as well as its energy sovereignty. Restrictions to access food and water regularly and in sufficient amount and quality take various forms: (i) the process of driving family farmers and peasants out of rural areas as a result of the expansion of monoculture schemes contributes to reduce the production of staple food products for Brazilians and to make seeds and crops grown by traditional populations disappear progressively. As mentioned above, this process also contributes to increasing urban and rural poverty, which in turn results in higher food and nutrition insecurity levels for these population groups; (ii) the unregulated expansion of agrofuels pushes the price of food products up, particularly of those made from raw materials that have a double role, i.e. that can be used to produce fuel of vegetal origin and food for human or animal consumption (soybeans, sugarcane, corn). In this process, the prices of food products which rely on the participation of these raw materials in their chain, such as milk and milk by-products, meat, eggs, sugar, cooking oil, margarine and products made from corn go up; (iii) the expansion of monoculture threatens access to freshwater, both in terms of volume (depletion of springs and ground water) and quality (contamination). That is, the way it is being implemented, this agrofuel-based energy policy is jeopardizing the sovereignty and food security of the Brazilian population. In addition, there is the risk of reproducing the prevailing "petrodependent" energy model, according to which fuel-producing countries are mere suppliers of raw materials to rich countries, without adding any value and without a debate on consumption patterns, thereby threatening the country's energy sovereignty.

g) Unemployment and degrading working conditions. The soybean and sugarcane mechanization processes contributed to increase unemployment in rural areas, expelling workers with low education and training levels and without work alternatives. In the sugar/alcohol industry, despite advances in labor formalization and income, working conditions are still unacceptable, particularly for sugarcane cutters: displaced from their native areas, in most cases they live in precarious camps, don't eat well and work for very long hours. Moreover, their income is conditioned to an increasingly inhuman productivity. Usually, health and safety measures are not appropriate, jeopardizing the quality of life of these workers, who also suffer devastating effects of burning sugarcane.

h) The means and ways of life not only of family farmers, peasants and rural workers, but also of traditional communities, such as descendants of runaway slaves and indigenous peoples, are jeopardized. Hiring indigenous people and descendants of runaway slaves to work in sugarcane plantations caused an imbalance in family bonds in their communities and jeopardized food crops inside their territories, forcing them to buy their provisions and, consequently, affecting their food and nutrition security.

i) Exclusion of women and young people, who don't fit in this model.

Fragility of the governmental strategy for the sector

It is believed that the government has not been making an effort to propose a sustainable development model for agrofuel production, with linked strategies to ensure food and energy sovereignty. Most of its efforts (financial, technological and institutional) are focused on strengthening agribusiness. The government has also failed to regulate the sector, avoiding higher inequalities in land ownership, the progressive foreignization of the chain as a whole, the destruction of major biomes, soil and water contamination, and violation of the human rights of both rural workers and traditional populations. Even in the case of biodiesel, which came to be through governmental intervention, the program has failed to achieve social inclusion and income generation objectives and is becoming another alternative to soybean monoculture.

Public interventions have not contributed to strengthening family and peasant agriculture, so as to integrate it into all the agrofuel chain. As a result, its role is limited to supplying raw materials, reinforcing agribusiness once again. In the case of ethanol, except for sporadic experiences carried out by PETROBRAS, no public measures focused on family agriculture have been taken and the government itself admits that this product is in the hands of the market. As for the production of vegetal oil, there is a consensus that the Biodiesel Program, as it is, will not make it possible to consolidate an autonomous family agriculture throughout the chain: lack of credit for producing raw materials and no specific public policies to promote the establishment of mini-plants, quality seed production, the dissemination of appropriate technologies, technical assistance actions, training, incentives to establishing associations and cooperation schemes, subsidy programs, insurance mechanisms, minimum prices and the inclusion of young people and women. Policies are also lacking for producing and supplying energy locally, not only based on agrofuels, but also on other sources, such as eolic and solar energy.

The need to build a common agenda

There is an understanding that agrofuels could generate positive opportunities to family and peasant agriculture. The common issue is taking advantage of these opportunities to build another development model, one which is sustainable, less capital-intensive and involving land, income and power redistribution, a model which contemplates policy options to ensure territorial sovereignty, with a decentralized and participatory management. Producing agrofuels from plants grown under family and peasant agriculture schemes, without using pesticides or chemical fertilizers, under a crop rotation system and in combination with food crops could improve the quality of life of the Brazilian population. Under this model, the State could foster the participation of family farmers through their organizations in drawing up and implementing agroecological rural development policies.

In addition, the basic principle is that family and peasant agriculture should grow food crops as a priority and, for this reason, the struggle for changes in how the State should act in relation to agrofuels should not be separated from the struggle for the land reform and for consolidating public policies designed to strengthen this kind of agriculture.

For this purpose, it was agreed that, respecting the specific features of social movements and civil society organizations, it is necessary to build a joint struggle agenda. It is therefore urgently necessary to continue to hold detailed discussions to qualify the criticism against the prevailing model while proposing counter-hegemonic alternatives.

2.2. Topics to be further discussed

Programa Nacional de Produção e Uso do Biodiesel – PNPB (*National Biodiesel Production and Use Program*)

Although there is a consensus that the program has not managed to strengthen an autonomous family and peasant agriculture, the position is not the same in relation to the design and implementation of governmental interventions. Some movements and organizations, particularly FETRAF and Via Campesina, believe that the main problem lies in the PNPB design. Although they acknowledge advances in this area, they believe that the program contributes to decharacterizing family and peasant agriculture, relegating it to a submissive role in relation to agribusiness. Therefore, the Social Fuel label is, for example, a tool that only benefits companies and not family farmers and peasants. In addition, the label is awarded for only two oil seeds - palm and castor bean -, discouraging production diversification. Moreover, it is a program structured around a petrodependent model, as it involves the use of fossil diesel, chemical fertilizers and pesticides. This is mainly why social movements have decided not to join the program: they believe that it was not designed to include family and peasant agriculture in the chain as a whole or to effectively promote diversified and integrated production schemes controlled from the grassroot level involving food and energy production and local energy to be consumed locally.

Although it challenges the program in different aspects, CONTAG believes that it is an important tool to promote family agriculture, particularly in the semiarid region. Their directors believe that the PNPB program should be reviewed and improved with the aim of progressively incorporating family and peasant agriculture into the agrofuel chain. Rural movements also need some time to organize themselves to participate in fuel industrialization and trade processes in a qualified way. For these reasons, CONTAG decided to support the program's implementation through various actions, such as by training federations, taking part in the process of awarding and monitoring the Social Fuel label, participating in the negotiation of contracts with companies, and implementing a system to organize production. The criticism against the present stage of the program is focused on the lack of mechanisms to leverage the production of oil seeds by family and peasant agriculture for complying with the compulsoriness of mixing biodiesel to fossil diesel (B2): credit, technical assistance, seeds, insurance, oil seed zoning, prices[16]. The lack of tools to deconcentrate the fuel production industry was also criticized. As for the next steps of the program, support to feasibility and profitability studies for all oil seeds is being claimed, as well as the establishment of optimized distilleries and crushers for family and peasant agriculture. CONTAG proposed that a fund should be established by charging R$ 0.01 per liter of diesel from petroleum for funding agrofuels produced under family and peasant agriculture schemes.

Energy matrix

During the seminar, different views on the domestic energy matrix were presented. According to some participants, family and peasant agriculture cannot solve the energy issue, as it needs scale to be efficient and affordable to all. From this perspective, family and peasant agriculture

[16] There are two kinds of price bottlenecks. The first one refers to the price for buying raw materials defined in ANP auctions. These prices are limited to the price of diesel from petroleum, which is quite low, since it is strongly subsidized by the State. As a result, the price paid to family farmers is not enough to cover their production costs. The second bottleneck refers to the market prices of castor bean and soybean oil, which are high, leading family farmers to sell in this market and not in the agrofuel market.

and small plants have not managed to solve their energy problem. It was mentioned that this debate should involve consumers, who today are concentrated in large cities, to check what concessions they would be willing to make in relation to the proposed model.

Others believe that the concept of scale was imposed by agribusiness. It is perfectly possible to establish energy sources closer to where the energy is consumed, provided that a different development model is implemented. For this purpose, changes need to be made in how energy is produced and consumed through a transition process designed to change energy matrix sources, stimulating small-scale alternatives of all kinds, such as small and medium-sized power plants (which cause less environmental impacts), agroenergy, eolic electricity, solar energy, etc. In addition, an idea of energy sovereignty should be built according to which every locality devises it own solutions with the aim of not depending on energy transported from other regions.

Other more pessimistic participants believe that that the energy matrix based on agrofuels that is being built is not feasible, since there is not enough land on the planet to produce the amount of fuel of vegetal origin that would be necessary to replace the current consumption of petroleum. They estimate that the system will collapse in ten years. The only possible solution would be to review demand for energy. It is therefore urgently necessary to discuss energy consumption in greater detail, as well as the relations between spaces or urban and rural territories. Anyway, they support the idea that priority should be attached to growing food crops under appropriate land use schemes.

It was suggested that the debates on agrofuels and on the energy matrix should address tree monoculture systems (eucalyptus and pinus), which constitute a major energy source (vegetal coal), particularly for supplying the steel industry. These forests are planted under a monoculture regime, and produce the same dramatic socio-environmental consequences as sugarcane and soybean monoculture schemes.

Certification

Some participants mentioned that transnational companies and developed countries are using the climate change agenda as an excuse to impose a certain type of model for agrofuels (the agribusiness model). For this purpose, they rely on certification mechanisms that, besides protecting the markets of central countries, contribute to increasing the profits of transnational companies. It was mentioned that certification processes are, in the way they are being implemented, emptying domestic socio-environmental laws and jeopardizing family and peasant agriculture.

Others believe that there are certification processes that can contribute to enhance the conservation of natural resources, increase the income of family farmers, peasants and rural workers and integrate producers and consumers through the establishment of fairer, solidarity-based relations throughout the production and trade chain. There is an understanding that certification can be a major path for strengthening family and peasant agriculture in the agrofuel chain.

2.3. Challenges

Challenges that were mentioned by representatives of various organizations and movements during the seminar will be listed below. They were not, therefore, discussed: it is very likely that not all of them are shared by all the participants. However, this broad range of options can be useful to social movements and NGOs in their individual strategies or in building a minimum agenda for joint work.

Family and peasant agriculture should be included in all the agrofuel production and trade chain by

- Implementing public policies linking energy production to food crops with the aim of ensuring food and energy sovereignty at the same time. Allocating resources to building self-sustainable communities for producing energy and food.
- Developing public policies designed to create appropriate conditions for adding value to family and peasant agriculture. These policies should be focused on encouraging associations and cooperatives; qualifying information and access to it, as well as to technical assistance and rural extension; to credit, insurance, minimum prices and purchase of products, construction of mini-plants and local infrastructure, and equipment. Technical and managerial knowledge should be transferred for the purpose of fostering the autonomy of family farmers and peasants.
- Promoting diversified agroecological and forest production systems which respect the natural cultural conditions at local level and ensure economic stability through market diversification.
- Improving the PNPB program through measures such as oil seed zoning, delinking of the biodiesel price from the price of diesel from petroleum, more detailed inspections of the Social Fuel label, feasibility studies for setting up and managing crushers and mini-plants.
- Promoting production from an agroecological perspective.
- Involving family farmers and peasants in producing quality seeds. Valuing traditional seeds.
- Ensuring more democratic access to and appropriation of knowledge. Technologies should be developed and transferred which conserve the environment while ensuring appropriate production levels.
- Identifying, appreciating and disseminating successful local experiences for verticalizing family agriculture in the agrofuel chain.
- Adapting agricultural and land-related laws to the needs of family agriculture (adjustment of productivity rates, cooperatives, solidarity-based economy).
- Establishing a fund to finance the production of agrofuels from vegetal species by taxing diesel from petroleum.
- Ensuring more democratic access of family farmers and peasants to carbon credit projects.

The decent work agenda should be implemented by

- Enhancing public inspection actions with the aim of universalizing formal labor relations and fighting the degrading working conditions and terrible living conditions faced by workers in sugarcane plantations.
- Developing training and intermediation public policies for rural workers who lost their jobs due to the expansion of monoculture schemes.

The agrofuel sector should be regulated by

- Enhancing inspection actions to ensure the enforcement of environmental laws and rules.
- Implementing legal measures to control the foreigners' control of the agrofuel chain.
- Regulating the advance of monoculture.
- Regulating the agroenergy market through a public organization. PETROBRAS should play this role.

- Creating and structuring a monitoring and follow-up system for agrofuels involving a pool of social movements, NGOs, universities and study centers, among others.

The land reform should be implemented by

- Changing the Brazilian land structure by expropriating large idle land areas and making land available to landless rural workers.

The energy production and consumption model should be reviewed by

- Taking measures to reduce energy consumption.
- Fostering a revolution designed to enhance the efficiency and sufficiency of the system by restructuring transportation flows (reducing the individual transportation of passengers and increasing collective transportation) and increasing energy efficiency.
- Implementing policies and programs designed to promote the local development of renewable energy sources.
- Involving urban movements and consumer defense movements in discussions on agrofuels.
- Fostering discussions on the relation between the expansion of agrofuels and the Food Security Organic Law (OSAN), which was passed in 2006.
- Incorporating the dimension of the human right to appropriate nutrition (HRAF).

The debate on the relation between agrofuels and topics such as regional integration and South/South cooperation, gender, youth, traditional populations, certification and patents should be expanded.

ANNEX

Sérgio Vignes

Organizations that attended the meeting[17]

- Ação Brasileira pela Nutrição e Direito Humano - ABRANDH
- ActionAid – AA
- Articulação Nacional de Agroecologia – ANA
- Banco Nacional de Desenvolvimento Econômico e Social – BNDES
- Casa Civil da Presidência da República/*Presidential Staff Office* (meeting after the Seminar)
- Central Única dos Trabalhadores - CUT
- Centro de Agricultura Alternativa do Norte de Minas Gerais – CAA
- Confederação Nacional dos Trabalhadores na Agricultura Familiar – CONTAG
- Departamento de Estudos Socioeconômicos Rurais – DESER
- Departamento Intersindical de Estatística e Estudos Socioeconômicos – DIEESE
- ESPLAR
- Federação de Órgãos para Assistência Social e Educacional – FASE
- Federação dos Trabalhadores da Agricultura Familiar – FETRAF
- Federações Estaduais dos Trabalhadores na Agricultura da Bahia e do Rio Grande do Sul – FETAG BA e RS
- Fórum Brasileiro de ONGs e Movimentos Sociais para o Meio Ambiente e o Desenvolvimento – FBOMS
- Fórum Brasileiro de Segurança Alimentar e Nutricional – FBSAN
- Fórum Matogrossense de Meio Ambiente e Desenvolvimento – FORMAD

[17] The government organizations and SEBRAE participated just in the first day of the Seminar.

- Heinrich Boll Stiftung
- Hemispheric Social Alliance – HSA
- Instituto Brasileiro de Análises Sociais e Econômicas – IBASE
- Instituto de Estudos Socioeconômicos – INESC
- Instituto Equit
- Instituto Terra Azul
- Instituto Terra de Direitos
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- Movimento de Atingidos por Barragens – MAB
- Movimento dos Trabalhadores Rurais Sem Terra – MST
- Organização Regional Interamericana de Trabalhadores – ORIT
- Oxfam International
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- Programa de Pós-Graduação de Ciências Sociais em Desenvolvimento, Agricultura e Sociedade da Universidade Federal Rural do Rio de Janeiro – CPDA/UFRRJ
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