

GBEP Working Group on Capacity Building for Sustainable Bioenergy (WGCB)

Bioenergy Week Summary

Brasilia, EMBRAPA Studies and Training, 18-23 March 2013

Presentations and Discussion

In the opening session, speakers from the Brazilian Government and members of the Global Bioenergy Partnership welcomed the participants of the Bioenergy Week. Dr. Mauricio Lopes, President of Embrapa, highlighted that economic growth and sustainability could no longer be considered opposite concepts, since they already presented many important synergies. He also emphasized the bioenergy as a relevant contribution to increase sustainability in transport and energy sectors, of which the 40 year-Brazilian experience on the matter could be an interesting case-study for other developing countries. Ambassador Luiz Alberto Figueiredo, Under-Secretary General for Environment, Energy, Science and Technology, recalled that Brazil has one of the cleanest energy mixes in the world and commented that the country is been able to produce food and fuel simultaneously under very strict environment regulations. Dr. Cid Caldas, from the Ministry of Agriculture of Brazil, noted that the Sustainability Week would not only be a chance to learn from the examples of sustainable bioenergy use in Brazil, but also - and more important - an opportunity to exchange information and views on the issue. Dr. Ricardo Dornelles explained that the Brazilian government chose GBEP as the main forum to discuss bioenergy issues internationally because of its diversity and the result oriented approach that is useful for countries interested in making bioenergy a drive to sustainable development.

For GBEP, Ambassador Mariangela Rebuá, Brazilian Co-chair, thanked Embrapa for accepting to host the Bioenergy Week, taking into account the successful efforts to show that bioenergy could play a bigger role in the sustainable development of rural areas, through the so-called "agroenergy systems". She also noted that bioenergy was likely to bring to the populations in those areas concrete results of sustainable development policies, such as lower energy imports and higher quality of life. Ms. Michela Morese, Executive Secretary of GBEP, stated that the Bioenergy Week represented concrete willingness of making the Partnership able to face the challenges to strengthen the role of bioenergy under the three sustainable development pillars, which are contemplated in the 24 bioenergy sustainability indicators discussed and agreed upon by GBEP partners. Mr. Raffi Balian, Co-Chair of the Working Group on Capacity Building, also thanked the hosts and the GBEP Secretariat for organizing the week and stressed that the participation of representatives from Central America, the Caribbean, West Africa, and Southeast Asia indicated strong interest in the potential of using bioenergy sustainably to promote economic growth, mitigate climate change, and improve social development.

Regional Overviews

This session highlighted the importance of bioenergy as one of several solutions to make energy systems sustainable by diversifying energy sources. Speakers also shared the view that national regulatory frameworks constitute a key factor for the development of sustainable bioenergy.

During the presentations, Dr. Ricardo Dornelles shared some figures related to the role of bioenergy in Brazil (up to 40% of all renewable energy production in Brazil, which accounts for roughly 45% of the total energy mix; hydroenergy being the major complementary player). He also highlighted the necessity of guarantees for investors, such as the mandatory mixture of ethanol in gasoline and a predictable and reliable regulatory framework, as part of a successful policy to foster bioenergy. Mr. John Yeboah, from ECREE/ECOWAS, presented an African perspective to the advancement of modern bioenergy in the continent, which would include the development of information, strategy and policy frameworks in order to overcome the reality of charcoal and firewood predominance in energy mixes and household consumption of energy.

Mr. Emerson Kloss, from the Ministry of External Relations of Brazil, elaborated on the current bilateral cooperation between Brazil and the USA, which included deepening of bilateral dialogue on renewable energy and promoting sustainable bioenergy in countries in Africa, Central America and the Caribbean. The trilateral cooperation is already presenting some good results as the identification process of areas where bioenergy is likely to be feasible and with capacity building activities. Raffi Balian, speaking on behalf of Natasha Vidangos, from the U.S. Department of State, stated that the participation of the private sector in research issues represented a key element of bilateral cooperation, which could be effectively put into practice by pilot projects and capacity building.

Mr. Arnold Dixmude, from the EU Delegation in Brazil, brought to the discussion the role of bioenergy in the EU Renewable Energy Directive (RED). He recalled the context of the RED creation, which was included in the EU Climate and Energy Package aiming at the increase of renewable energy in the Union energy mix to 20% by 2020. He highlighted how the EU is addressing some controversial issues, such as indirect land use change (ILUC) and the proposal to limit to 5% the participation of first generation biofuels in the goal of 10% of renewable fuels by 2020. Lastly, Ms. Maslan Lamria, from Indonesia, shared the Asian perspective to bioenergy. She stressed the great potential of modern bioenergy still underdeveloped in the continent, recalling the high share of bioenergy in many countries where household consumption is considered. She concluded that overcoming this challenge requires the implementation of appropriate technologies, more effective policies and right financial schemes (fee-in tariff and price index, as examples).

State of the art in feedstock production and bioenergy conversion processes

This session encompassed five presentations that aimed at sharing pioneer experiences in bioenergy production. Mr. Suleiman Hassuani, from the Center for Sugarcane Technology (CTC), presented the main advances in the biofuels production chain in Brazil, illustrating the technological progress achieved in studying sugarcane varieties and in implementing modern biofuels plants, in order to guarantee sustainable production patterns (treatment of residues, dry cleaning of sugarcane, cogeneration). Mr.

Daniel Furlan (ABIOVE) presented the Brazilian experience in sustainable biodiesel production, focusing on the Palm Oil Agroecologic Zoning and the Soy Moratorium. He also stressed the contributions from the biodiesel industry to sustainable development (in its three dimensions): income generation, job generation, currency savings in diesel imports, lower GHG emissions.

Mr. David Vander Griend, from the U.S. engineering firm ICM, stressed the importance of providing innovative technology solutions and services to sustain agriculture and advance renewable energy. He observed that energy consumption and human health can be linked. He also stressed how bioenergy production can contribute to increasing energy access and thus the well-being of the population.

Mr. Guy de Capdeville offered a glance of EMBRAPA's work and the value of research and new areas of studies regarding biofuels feedstock. Ms. Alda Lerayer shared Solazyme's ground-breaking experience in generating bioenergy from microalgae, which could represent an innovative way to sustainably producing biofuels regardless of specific feedstock availability.

Environmental pillar

This section aimed at analyzing different aspects and actions concerning the environmental pillar of sustainability. Ms. Rita Monteiro (IEE/University of São Paulo) highlighted that the efficient use of water, without affecting both quality and availability, constitutes an issue of great environmental significance. She indicated different approaches regarding water footprint and presented the ISO's effort to produce a standard on water footprint methodologies, based on an impact assessment. Mr. Luis Carlos Job (Ministry of Agriculture, Livestock and Food Supply of Brazil) presented the country's experience on the Sugarcane Agroecological Zoning (Zaecana) and its contribution to public policies for the sustainable and balanced growth. The main goal of the Agroecological Zoning was to identify areas with climate and soil potential for sugarcane production with reduced impact on the environment, which is in line with GBEP indicator of land use. As he emphasized the Brazilian willingness to share its experience, Mr. Job observed that tools like Zaecana should engage all stakeholders and be conducted from a strict technical point of view, in order to guarantee real efficient and sustainable land use.

Ms. Martina Otto's presentation (UNEP) focused on natural resources use efficiency. Ms. Otto observed that transformational changes and innovative integrated solutions based on integrated assessments are needed and that bioenergy can be a part of those innovative solutions, which demands good planning and management. In this context, she stressed key action areas: bottom-up land use planning and water management, coordinated policies, integrated systems, best practices and monitoring performances. Mr. Celso Manzatto discussed the productive capacity of Brazilian lands and ecosystems, sharing the country's experience in soil assessment and its importance to ensure a sustainable bioenergy production. He indicated the possibility for Brazil to further expand its bioenergy production based on 3 action fronts: technology development, economic strategy (adding value to products) and efficient use of resources.

Mr. David Alencar (Raízen) showed the Brazilian sugarcane private sector commitment to promote a sustainable bioenergy production. He presented the

Agroenvironmental Protocol, an initiative of sugarcane producers from the São Paulo state, who decided to voluntarily anticipate the Government's goal to completely eliminate practices of sugarcane burning, bringing tangible environmental benefits. He also presented the project RenovAção, another initiative from the private sector to train and re-qualify workers in response to the process of mechanizing the sugarcane harvest to eliminate burning.

Mr. Emerson Kloss (Ministry of External Relations of Brazil) shared the Brazilian perspective regarding the creation of international standards and certification procedures for bioenergy as an essential means toward the commoditization of biofuels. As producers aimed at accessing the international market and in response to chances in the regulatory framework, schemes of sustainability certification, such as Bonsucro, ISCC, RSPO, RSB and ISO, appeared. In the particular case of ISO, Mr. Kloss emphasized its weight since ISO's standards are considered compatible with international trade regulations by the WTO, which brings great importance to the current ongoing negotiations concerning bioenergy sustainability criteria.

Dr. Bob Bilby, from Weyerhaeuser, stressed the importance of sustainable management and shared the company's experience in creating a Research Platform with local researchers in Uruguay that established a system of study sites in order to collect a set of basic environmental data to guarantee a sustainable pattern of production. Representing ICONE, Mr. Marcelo Moreira addressed the GHG lifecycle analysis, noting that the carbon footprint emerges as a useful tool for scientist, policy makers and other stakeholders. As he presented the 3 main policies in this area (Renewable Fuel Standard-RFS2, in the U.S.; Low Carbon Fuel Standard-LCFS, in the state of California; Renewable Energy Directive and Fuel Quality Directive, European Union) he stressed that LCA methods are mature, while iLUC models are improving but still remain immature. Mr. Moreira indicated that LCA is a valuable tool to guide policies but emphasized that its methodologies must remain science-based.

Field Trip to EMBRAPA Cerrados

On the afternoon of 19th March, during a Field Trip to the Embrapa Cerrados Headquarters, the participants of the Bioenergy Week were presented to some of the most advanced research Brazil is conducting in the bioenergy area, including experiences with crops of jatropha, sugar cane, palm and macaúba (a typical palm tree from the Cerrado region in Brazil, which is very similar to the Savannah vegetation).

Social Pillar

This session encompassed seven presentations and was chaired by Francesco Pierri (International Adviser, Ministry of Agrarian Development, Brazil), who highlighted the importance of bioenergy as one of several solutions to include smallholders and local communities in the energy system, giving them access to clean and affordable energy.

Mr. Rodrigo Rodrigues (Biodiesel Federal Program Coordinator; Chief of Staff Office, Brazil) shared some thoughts on the Biodiesel auctions and the "Social Fuel Seal". Amongst the main directives of the Brazilian Biodiesel Program, he highlighted the creation of jobs and income, particularly for family farmers in rural areas; the reduction of regional

disparities; and the reduction of GHG emissions and diesel imports. Currently there is a mandatory mixture of 5% of biodiesel to traditional diesel and some biodiesel tax incentives. Biodiesel is currently more expensive than diesel, but the auctions have stimulated competition and participation of family farmers. The main feedstock used in biodiesel production has been soy (75%, as an average), followed by animal fats (17%) and others (8%) – cotton, palm, sunflower, castor. The biodiesel production provided employment to 103.991 family farmers in 2012 (25% in Northeast region), and 86.112 of those are skilled jobs (biodiesel industry). The average income of those families is R\$ 14.566,00/family/year or US\$ 7,283.00 (revenue with the sale of feedstocks to biodiesel production only).

Prof. Suani T Coelho (PhD, Coordinator CENBIO/IEE/University of São Paulo, Brazil) made a presentation about access to modern energy services, highlighting the use of agro-industrial residues as a sustainable and reliable option. There is an urgent need to guarantee access to clean and affordable energy which is one of the “Sustainable Energy for All” initiative. Waste-to-energy process produces energy and, in addition, is the solution to the problem of pollution their simple disposal would cause. There are technologies for biomass-based electricity generation commercially available in large-scale steam cycles, for sugarcane, pulp/paper and wood sectors (for example, high pressure biomass-fired boilers; fluidized bed boilers; back pressure steam turbines and condensing extraction steam turbines) and in small-scale steam turbines – small villages (200 kW-1 MW). Among the lessons learned from the projects about energy access from biomass in remote/rural villages, Professor Suani Coelho emphasized the need for technical assistance (gasification technologies must be tested and adapted to remote villages/rural areas; capacity building of local people; participation of the local electricity utility); economic sustainability (economic feasibility of small scale biomass-based technologies; adequate policies to encourage renewable energies; additional R&D for the development of small scale gasifiers) and environmental sustainability (use of agricultural/rural residues or sustainable wood residues; technology must be environmentally friendly). The benefits of this kind of projects are the improvement of energy access mainly in rural areas; the use of sustainable biomass (residues from sugarcane plantation/bagasse or wood plantation, vegetable oils); technology is commercially available even in small scale systems (200 kW). It is important to have adequate policies to encourage decentralized generation, as well as capacity building and supply of spare parts.

Mr. Olivier Dubois (FAO) elaborated on the links between bioenergy and food security, stating that they can be positive or negative and that they can affect the four dimensions of food security (availability; access; utilization and stability). Besides, since these consequences are complex and site specific, local evidence based assessments are needed and it is not possible to make global statements about bioenergy. It is important to assess the source of feedstock used and to check about what amount and kind of land needed. Biofuels currently use only about 3% of all arable land, but this percentage could rise to 5-8% in the next decades. Also, he emphasized that sustainable agricultural intensification may reduce pressure on land; nevertheless, it is necessary to be careful about competing use of residues. He gave examples of good practices in integrated food energy systems. He confronted the idea of the second generation biofuel as the silver bullet. Finally, he affirmed that in order to make sustainable bioenergy possible, some conditions are required: an in-depth understanding of the situation and related opportunities and risks as well as synergies and trade-offs; implementation of good practices by

investors/producers in order to reduce risks and increase opportunities; an enabling policy and institutional environment to promote the implementation of good practices; appropriate monitoring and evaluation of impacts and performance of good practices and policy responses; will, capacities and good governance to implement the above.

Dr. Gerard J. Ostheimer (Ph.D., United States Department of Agriculture, Foreign Agricultural Service) spoke about on-farm waste-to-energy for increased agricultural productivity. He mentioned that the United States has an “all-of-the-above” policy regarding energy, which means developing every source of energy available, including biofuels. U.S. livestock production generates a lot of carbon co-products (methane) and USDA helps farmers to use methane to power farm operations or to feed into the electrical grid. To increase agricultural productivity, dairy farmers are implementing the process of anaerobic digestion of manure, in order to produce a treated effluent that is stable and pathogen free, the digestate – or slurry, which is rich in Carbon, Nitrogen and Phosphorous and is an excellent soil fertilizer. Biogas is generating jobs and higher farm income in rural America. These plants can be scaled for household or village use. He presented other examples: in Honduras and Colombia where USDA is promoting biogas as a means to energy access and bio-waste management. Wet-processing of coffee generates pulp biomass and waste water. Anaerobic digestion of wet coffee pulp both helps reduce pollution of local waterways and generates energy that can be used to dry the coffee beans; thereby boosting farm productivity. Palm oil production and processing is a rich source of biomass for agriculture and bioenergy (10% oil - 90% biomass). Palm oil mill effluent (POME) spontaneously generates methane by anaerobic digestion in waste ponds. The efficiency and profitability of the palm oil business can be increased by harvesting that energy and using it to power the palm oil mill.

André Novo (Embrapa Pecuária Sudeste, Brazil) discussed the sugarcane-biofuel expansion and dairy farmers’ responses to these competitive uses of land in Brazil. The country is currently the 5th world biggest milk producer, and it is experiencing steady increasing rates and a horizontal expansion, since ranchers consider milk as a by-product with monthly revenue, low risk, no specific investments and no contractual obligations. He mentioned low competitiveness as a pulling force for land use changes. In Brazil, the competitiveness of dairy production has increased in the last decade, but dairy farming in São Paulo state became less competitive regardless the biofuel economy (the causes are: the expansion for other states; some technological innovations (UHT); prices variations in milk and beef; concentration process of industries and retail sector). The recent demand for biofuels has a relative small role in the overall type, rate and direction of land use changes for this particular case. Sugarcane can support the conditions for intensification of family dairy farming, as a form of diversification (extra income, increasing the resilience and lowering risks and uncertainties). The expansion of biofuels should not be seen as a threat to the use of land, but as an opportunity to producers. Consideration of this matter is very complex and site specific and should not be simplified.

Esmeraldo Antonio Goncalves (CEO and Agricultural Supply, Belém Brazil Bioenergy, Brazil) presented an overview of Palm production in Brazil and the Belém Brazil Bioenergy's experience in the Amazon. The Project Belém is being developed by Petrobras Biofuels and Galp (from Portugal) since 2007 and aims to sustainably produce palm oil in Brazil and biodiesel in Portugal. They intend to have implemented, by 2016, 60.000 hectares of Palm trees, producing 335,000 ton/year of palm oil. The total

investments are around US\$ 300 million, and include 600 smallholders and generate 7.500 direct jobs. The project can improve conditions for the population and generate jobs. The company provides them with free technical assistance and the number of rural families within this project is increasing, as well as their incomes (it is expected that they will have a R\$ 24,000 annual income by the seventh year of this project). There is also a concern about human rights and fight against slave labor and child labor within this project.

Idrissa Ba (Mali Biocarburant) presented his company experience on building farmer's income and safety nets while securing local energy supply in West Africa. In order to be the leading specialty oil and biodiesel supplier in West Africa through localized production, Mali Biocarburant (MBSA) follows, in Mali and Burkina Faso, a business model in which smallholders are shareholders and intercropping, outsourcing and multiple feedstock, and the links between food and fuel are a reality. The company is scaling the *Jatropha* feedstock and expects to have 6 million trees in 2015 (there were 300.000 trees in 2007), what will give to the shareholders better conditions (better cash income and better conditions to fight malaria, among others). MBSA is developing a partnership with IFAD (International Fund for Agricultural Development), aiming to scale-up the MBSA experience in Mali and Burkina Faso to a total of 5 countries in the African West so as to allow smallholder farmers to benefit from improved food production, biofuel production and the carbon credit market. For IFAD, this partnership means a new, alternative way to support rural poor and a way to diversify the incomes of smallholders through the involvement of the private sector. For MBSA, this partnership increases likelihood of having larger and more consistent feedstock supplies and increases potentials for longer-term partnerships (with POs, local institutions; etc.). For smallholders, it means the benefit of a secure market for final products and hence more sustainable revenues; easier access to support services; besides, it strengthens smallholders relevance within the value-chain.

Family agriculture and Rural Development

In this session, seven presentations from speakers from different regions aiming at analyzing the role of family agriculture in promoting rural development and social inclusion with bioenergy were made.

Mr. André Machado (Ministry of Agrarian Development - MDA) presented some figures about the participation of family agriculture in Brazil, where it is responsible for around 84% of total agricultural production and 70% of food production (thus contributing to food security), using only 24% of agricultural land. He stated that the concept of family agriculture is defined by law and that the Brazilian policies for family agriculture are based on the tripod: credit, technical assistance and market access. The Government supports family farmers through programs such as PRONAF (National Program for Strengthening Family Agriculture), which concedes special interest rates and credit lines, and SEAF (Family Farmers Insurance), which protects family farmers in case of bad climatic conditions. Between 2002 and 2013, resources to family agriculture have increased substantially (to about U\$ 9 billion), especially to the Northeast region. There are other programs, such as PAA (Food Purchase Program) and PNPB (National Program for Production and Use of Biodiesel) which guarantees market access to family farmers. The Social Seal of PNPB gives tax exemptions to biodiesel plants which regularly purchase a percentage of raw materials produced by family farmers and provides technical assistance to farmers.

Mr. Juliano Mendes (Fundação Getúlio Vargas - FGV) presented the role of biofuels for income distribution policy, illustrating the case with family agriculture in biodiesel production with Palm Oil in the Northern region of Brazil. Ongoing projects will involve 5.000 families, with financing offered by Brazilian government and official banks. The productivity has improved and is now equivalent to that of big producers (25-30 tons per hectare).

Ms. Kristen Johnson (U.S. Department of Energy - DoE) discussed the U.S. perspective on sustainable bioenergy supply chains. She gave an overview of DoE's support for bioenergy technologies, which aims at increasing energy security and economic viability of the industry, helping to transform biomass resources into commercially viable biofuels, bio-products and bio-power. She explained that the key policy driver is the US Renewable Fuel Standard (RFS), which presents targets for conventional, advanced (reduces 50% of GHG emissions) and cellulosic (reduces 60% of GHG emissions) biofuels consumption by 2022. The DoE is implementing a sustainability framework to understand and promote the positive economic, social, and environmental effects and reduce the potential negative impacts of the bioenergy production chain. Although it was highlighted that sustainability measures and interpretations are context specific, some of the methodologies are translatable to other contexts, with the help of mechanisms such as GBEP.

Mr. Eric Ofori-Nyarko (Energy Commission of Ghana) shared his country experience, advocating that family agriculture and rural development contribute to poverty alleviation. There are some issues which need to be addressed, such as lack of appropriate agriculture policies, limited technology adaptation and agriculture input, lack of infrastructure, inadequate marketing strategies and unfair trade, heavy burden on women in family agriculture and frequent extreme weather events and climate change. Various attempts have been made to overcome these challenges, such as the Comprehensive African Agriculture Development Programme (CAADP). Africa has its challenges and differentiated strategies are needed, taking into account context peculiarities.

Dr. Betsy Bandy and Mr. Gerald Lindo (Ministry of Science, Technology, Energy and Mining of Jamaica) offered a glance of bioenergy development in the country, which is heavily dependent on fossil fuel imports and where electricity is very expensive (US\$ 0,40/KW). Most of the country biomass consumption is for cooking (charcoal, fuelwood). Despite being a sugarcane producer and having a mandate for 10% blend of ethanol in gasoline (E10) since 2008, Jamaica imports ethanol, mainly due to a lack of appropriate regulatory framework. The Government privatized the sugar sector, which accounts with 35% of small farmers and has a low productivity (54.7 tonnes per hectare). The National Energy Policy (2009 – 2030) was approved but the Biofuels Policy (2010-2030) is still under consideration, as well as the B5 ASTM Biodiesel Fuel Standard (to mix 5% of biodiesel in diesel). The Biofuels Policy aims at the production of bioethanol, biodiesel, bioelectricity and other byproducts.

Mr. Luis Fernando Velasquez Pottier (Ministry of Energy and Mines of Guatemala) stated that although his country is the largest ethanol producer in Central America (with very high sugarcane productivity – 93 tons per hectare), due to an inappropriate regulatory framework (price fixing mechanism), 90% of the alcohol produced is exported to Europe, Central America and Mexico (the rest is used in the country for industrial and food

purposes), and nothing is used on the transportation sector, heavily dependent on fossil fuels. There is no biodiesel law, but a small production of 15,000 liters / day from various sources of biomass.

Mr. Le Hong Quang, (Ministry of Industry and Trade of Vietnam) showed the Vietnamese perspective on bioenergy. In 2011, Vietnam had 110 millions tons of biomass (46% of energy matrix), of which 70% came from agriculture by products (rice and hog wastes) and 30% from wood residues. The installed capacity for ethanol is 495 mil liters per year (which is exported) and the country aims at establishing an E10 mandate by 2017. Vietnam is building a mechanism of sustainable use of biomass, trying to reduce the direct burning of biomass and urging people in rural areas to use efficient stoves and more biogas plants.

Field Trip to biodiesel industry

On Thursday, the participants went to a biodiesel plant (Granol) in Anápolis, Goiás. Granol is a Brazilian producer of soybean, vegetable oils and biodiesel. It currently produces more than 500,000 liters of biodiesel from soya per day and 20% of the material used comes from family farming. This industry implemented the Social Fuel Seal since its beginning (2007) and works with smallholders and rural families since then, providing them with technical assistance. Also, this plant implemented many social and environmental projects, such as the Project Ação 3 R (Reduce, Reuse and Recycle), in which the company buys used oil to produce biodiesel and reforest the plant area. The participants of the Bioenergy Week were presented to some of the production phases of this plant, which uses only renewable energy (sugarcane bagasse and woody biomass) during the processing. The participants visited the area in which edible oil is produced and bottled, as well as the area in which biodiesel is produced and stored. They also had access to the labs in which biodiesel is analyzed.

Economic Pillar

This session aimed at analyzing different aspects and actions concerning the economic pillar of bioenergy sustainability. Dr. Manoel Souza, Chief of EMBRAPA Agroenergy, highlighted the importance of productivity and improved efficiency in the use of biomass to produce bioenergy. Biotechnology is used in sugarcane production and nowadays there is a focus on biomass from residues to produce bio-based chemicals. Forest plantation is growing in Brazil and the productivity of eucalyptus increased 83% from 1980 to 2011 (also the cycle of production was also reduced to 7 year - average of 15 years in other countries).

Mr. Eduardo Leão, Executive Director of UNICA, an association which gathers 60% of sugarcane producers in Brazil, presented the RenovAção Project, launched in 2010. The project was thought in the wake of the state of São Paulo's legislation to eliminate pre-harvest sugarcane burning. In 2007, UNICA signed the Green Protocol to anticipate the end of straw burning from 2021 to 2014 and established the mechanized harvest in areas with low declivity. RenovAção project aims at capacitating former sugarcane cutters and counts with the support of many partners, including the IDB. Workers are trained either to continue working on the mills (as harvest operators, truck drivers, electricians) or to other activities

in the community (such as plumber, horticulture, baker, manicure). There are also alphabetization courses for the least educated and a women's module for gender inclusion. Average salaries were raised by 61% and the project has already trained more than 5 thousand workers.

Mr. Miguel Almada, from the Ministry of Agriculture, Livestock and Fisheries of Argentina, highlighted the economic aspects of bioenergy development in his country. Argentina is the first world exporter of biodiesel (it exports almost 2/3 of its production, mainly to the European Union). In the last 10 years, the productivity of vegetable oil by ton of soybean has increased (the average production of soybean from 2009 to 2013 is 60 million tons/year). Biodiesel plants are concentrated in the Paraná river basin, closer to the ports, which facilitates logistics. There is an E3 ethanol mandate and a B7 biodiesel mandate in Argentina. Probiomassa program was launched to increase to 10% the biomass share in the energy matrix (nowadays it's 2,3%), which will generate 2 billion dollars savings in fossil fuel consumption per year.

Mr. Henry Joseph, from ANFAVEA (National Association of Automobile Manufacturers), talked about the flex-fuel vehicles in Brazil, highlighting the importance of flexibility for biofuels use in the transportation sector. The history of ethanol use in the transportation sector was presented, since the first experiments in the 1920's, until the Proalcool program in 1975 (due to oil crisis), the liberalization of the market in the 1990's and the sector's resurgence with the flex-fuel cars in 2003. He explained that up to an ethanol blend of 15% in gasoline adaptation on the vehicles is not required. Higher blends will require different changes in the vehicles according to the fleet age and the blend used. In Brazil, consumers can choose to use gasoline (E18-E25) or ethanol (price must be 70% of the gasoline) and this flexibility provided by flex-fuel cars permitted that consumers were more confident in the technology.

Mr. Gustavo de Albuquerque Kuster, from INMETRO, talked about standards and specifications of biofuels, explaining the work done together with NIST (US National Institute of Standards and Technology) and the Directorate General for Energy of the European Commission (DG Energy). The trilateral force organized a series of international conferences on Biofuels Standards and also developed certified reference materials (standards) for biodiesel and bioethanol, in order to help turning them into commodities.

Mr. Adilson Liebsch, from Amyris, showed an overview of the company and spoke about the creation of drop-in fuel value chains. He presented the genetic modified yeast (farnesene) developed to produce fuels, lubricants, chemicals and cosmetics from sugar, stating that GHG emissions from sugarcane diesel is next to those of ethanol. It was presented some of the company's work with sugarcane biofuels for aviation. Mr. Vinícius Neves Bueno, from Petrobras, presented the Brazilian experience in ethanol distribution logistics, which had to be adapted due to the shift of the production from the Southeast region to the Central region of the country. About 85% of ethanol is transport by roads, 10% by railways, 5% by waterways and less than 2% by pipelines. Finally, Mr. Tarun Rokadiya, from Abellon CleanEnergy, presented the company's integrated bioenergy model. India generates 500 million tons of residues every year and, with an integrated approach to sustainability, Abellon collects these biomass residues and turn them into shredded and densified biomass pellets with high calorific value for electricity generation.

Densification enhances the economic value of the biomass and there's flexibility in raw materials (the product can also be designed for specific uses).

Funding opportunities

This session encompassed five presentations about funding opportunities in the area of bioenergy. Mr Raffi Balian emphasized this is one of the most important challenges communities face in order to find solutions in the bioenergy area. As political will, R&D and funding are fundamental criteria to develop bioenergy, it is important to combine the work of government, private sector and research sector to enhance the importance of renewable energy.

Artur Yabe Milanez (Department of Biofuels, Brazilian Development Bank - BNDES) stressed the importance of BNDES to the development of bioenergy in Brazil (about US\$ 15 billion in the last decade). BNDES also has tools to stimulate bioenergy abroad for projects that use equipment or services from Brazil. Other initiative regarding biofuels is the bioenergy feasibility studies in (ECOWAS) financed by BNDES. He added that BNDES and Finep created the Joint Plan to Support Industrial Technology Innovation for the Sugarcane Industry (PAISS), in order to foster, select and finance initiatives that focus on developing, producing and commercializing new industrial technologies to process biomass. Initially, they offered US\$ 625 million to support R&D in the areas of 2nd generation bioethanol; new products for sugarcane; and gasification. The program represents an opportunity to join initiatives from the government, business and technological institutions and to keep Brazilian leadership on this area. According to BNDES, food security issues are addressed with tools like the Agroecological Zoning and the Reports and Assessments on Environmental Impacts.

Ruben Contreras (Organization of American States – OAS) presented how OAS support bioenergy projects in the Americas. The OAS promotes the development of Sustainable Bioenergy as a strategy in support of the rural development (employment, business development, infrastructure); energy security and energy diversification; contribution to sustainable emissions reductions; promotion of the development of sustainable biofuels policies, of better management practices and of capacity building. The Action Plan of OAS aims to facilitate the articulation of adequate policy and regulatory frameworks for biofuels development; to identify potential initiatives for biofuels production and use; to promote feasibility studies on biofuels production and use; to support the Creation of a Sustainable Biofuels Network and to Support other Clean Energy and Climate Change Mitigation Initiatives. The OAS manages a series of bioenergy initiatives with LAC third-party countries under the US-Brazil partnership. According to OAS, the most important challenges for Bioenergy in LAC are the lack of technical information regarding biomass resources; poor energy and agricultural infrastructure for bioenergy development; lack of human and institutional capacity; absence of legal frameworks and regulations that address the development of bioenergy; lack of knowledge in the general public about the benefits that can be attained through the development and use of bioenergy; smallholder farmers in LAC face high certification costs. The development of a carbon-neutral biofuels based on sustainable management and agricultural practices is of major importance to meet the sustainability principles committed by the GBEP members. It is necessary to demystify bioenergy based on sustainable principles to attract investment into the sector to improve socio-economic development and environmental protection in

LAC countries. In general, OAS uses many indicators to assess food security (GBEP, IDB ScoreCard, etc.) before any project is designed and implemented.

Marco Aurélio Lenzi Castro (Inter-American Development Bank - IDB) presented the tools used by IDB to support bioenergy projects in developing countries, such as loans and non-refundable technical assistance. IDB aims to develop the region and supports biofuels that contributes to the social and economic development of its member countries; reduce poverty; promote sustainable development; among others. IDB designed a Score Card for Sustainable Biofuels which aims to provide a tool to think through the complex issues associated with biofuels, encouraging higher levels of sustainability in such projects.

Gregor Wolf (World Bank Group – WB) shared the experience of the WB with bioenergy projects. He presented the WB different institutions and lending instruments, such as the International Bank for Reconstruction and Development (IBRD), which lends to governments of middle-income and creditworthy low-income countries; the International Development Association (IDA), which provides interest-free loans—called credits— and grants to governments of the poorest countries; and the International Finance Corporation (IFC), the largest global development institution focused exclusively on the private sector, which help developing countries achieve sustainable growth by financing investment, mobilizing capital in international financial markets, and providing advisory services to businesses and governments. The WB stimulates a green and inclusive growth, which is robust economic growth that is environmentally sustainable and inclusive. In the agriculture sector, that means improvements in efficiency (improvements in yields of crops and livestock); clean energies (reduction of pollution); resilience to climate change; and inclusive of small producers in the value chain. On the biofuels and bioenergy sector, the IBRD is still mostly focused on low risk countries, and still hesitates to finance projects on bioenergy because of the supposed food vs. fuel controversy and also because the transaction costs to this kind of operation is still considered high. Nevertheless, IFC plays a leading role when there is private sector engagement, as it happened with the Usina São João Project, where most of the expansion in sugar cane supply came from small and medium farmers in Goiás with farm low return crops. Mr. Wolf indicated the importance to claim political attention to the need of funding for bioenergy (both nationally and internationally).

Stefan Mård (Senior Advisor, Sustainable Development, CleanStar Mozambique) shared how his company and Novozymes are working to create a value chain to meet national needs. The solution created by CleanStar Mozambique includes ethanol-based cooking fuel and ethanol cook-stoves, which allow clean, safe and fast cooking and a cheaper than charcoal solution. Each family uses around 20 liters of ethanol per month and saves emitting 1 tone of CO₂ per month. CleanStar Mozambique provides retailers technical assistance and buys feedstocks from smallholder farmers, with a low input agroforestry cultivation system that is at the core of their partnership, alongside with the rotation of cultures, complying food and fuel aspects in integrated food and energy agroforestry systems. This venture was initiated in 2008 (brainstorm and concept phases, feasibility studies) and faced many difficulties to raise funds and to get support from the government, which had an erratic policy regarding biofuels. Mr Mård also emphasized the lack of different alternatives on financing bioenergy projects. Currently, CleanStar Mozambique initiative encompasses a 3000 farmers network, including 7 communities, thus creating a bioenergy economy. According to Mr Mård, they will achieve profitability in 2014 and then

expand in Mozambique and beyond (4 or 5 other countries), creating new and different models of cookstoves.

General conclusions

1. National bioenergy policies should be assessed in the broader context of other renewable energy sources and of regional approaches to bioenergy. It is crucial that all relevant and interested stakeholders be engaged in this process.
2. There is a need for a stable regulatory framework that should also be flexible to be adapted to local realities and needs as well as to attract new investments.
3. The development of bioenergy worldwide will benefit from public and private investments on R&D, in particular on new technologies adapted to local conditions and for improving agricultural productivity.
4. Environmental objectives such as GHG reduction emission, water and soil conservation, protection of biodiversity require science-based policy instruments that allow for the efficient use of natural resources in the bioenergy sector. Sustainable practices are more easily implemented when private companies consider them as business opportunities.
5. With policies that are adapted to the local peculiarities, bioenergy can provide social benefits to small and family farmers and promote rural development and therefore be an important instrument for poverty alleviation/wealth creation.
6. There is a need to assess bioenergy resources to appropriately define a regulatory framework that can work to attract commercial projects. It is important to place bioenergy in the broader water-energy-food-climate “nexus” (increasing efficiency, addressing trade-offs, building synergies, improving governance across sectors).
7. The integration of biofuels into one country’s fuel system is complex and requires technological innovation, constant adaptation, and planning. On the other hand, there are opportunities for building new value chains either for low value biomass (crop residues) or for high value goods (cosmetics, plastics, new fuels and chemicals). Diversification can be good for business and nature.
8. Technical assistance must be tested and adapted to remote villages/rural areas and engage local institutions.
9. Financing mechanisms are key to the development of small, medium, or larger scale sustainable bioenergy projects. Lack of knowledge about the positive impacts of bioenergy projects may be a barrier to finance even with consistent business plans. An *ex ante* sustainability assessment by the national/international financial institutions should take into account the local circumstances and the sustainability aspects that may be impacted by the projects.
10. Good bioenergy policies have a lot to do with good governance. Best feedstock, land, technologies, policies and regulations mean nothing without good decision-

making, implementation and enforcement mechanisms (commitment and means to progress).

11. Good ways to increase synergies between food and fuel include integrated food energy systems, increase yield efficiency and residue use.
12. Current experiences have indicated that bioenergy can promote rural development, be inclusive to smallholder farmers and integrate family agriculture to more complex agricultural production systems. Bioenergy sustainability assessment must be based on local evidence and therefore general statements should be avoided.