LAMNET-NEWS 6th issue – December 2004

# LATIN AMERICA THEMATIC NETWORK ON BIOENERGY

# LAMNET

**The global bioenergy network LAMNET consists of 48 partners and 150 associate partners from more than 35 countries worldwide with excellent expertise in the field of biomass.**

**In the last 3 years the LAMNET World Network on Bioenergy succeeded in setting-up a trans-national forum for the promotion of the sustainable use of biomass in Latin America, Europe, China and Africa.**

**12 LAMNET workshops have been organised in Europe (Amsterdam, Rome), Africa (Durban), Latin America (Brazil, Chile, Mexico, Venezuela) and China (Beijing, Dalian, Guangzhou) stimulating the exchange of knowledge between international bioenergy experts and contributing to the elaboration of worldwide bioenergy strategies and policies as well as the identification of opportunities for international technology co-operation projects.**


www.bioenergy-lamnet.org

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LAMNET-NEWS
LAMNET – The Global Network on Bioenergy
6th issue – December 2004

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## Highlights:

### Kyoto Protocol to enter into force on 16 February 2005

The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) was established in 1997. The protocol enters into force 90 days after it has been ratified by at least 55 parties to the UNFCCC, accounting for at least 55 percent of the total 1990 carbon dioxide emissions. After Russia's ratification, the protocol will now become legally binding to its 128 Parties on 16 February 2005.

### 200 Participants attend 12th LAMNET Workshop in Chile

The 12th LAMNET workshop in Viña del Mar, Chile, 8-10 November 2004, was jointly organised by the School of Biochemical Engineering, P. Universidad Católica de Valparaiso and the LAMNET consortium. This International Workshop 'Bioenergy for a Sustainable Development' was inaugurated by the Governor of the Region of Valparaiso and with its 200 participants from the governmental, academic and industrial sector constituted one of the largest bioenergy events in Chile ever. In the framework of the workshop several international cooperation activities in the field of biogas and waste treatment have been initiated which will be promoted and supported in follow-up actions of the LAMNET project. Additionally, this workshop set the stage for the creation of a national Network on Renewable Energies in Chile.

### Policy Dialogue Workshop on Biofuels, Renewable Energies for Public Health and Enterprise development in Lusaka, Zambia

The Policy Dialogue Workshop on Biofuels, Renewable Energies for Public Health and Enterprise development in Lusaka, Zambia, 14-16 December 2004 was a resounding success. This event was organised in the framework of the project PARTNERS FOR AFRICA funded by the European Commission's INCO programme (DG Research). This project is implemented in co-operation with the European Energy Initiative for Poverty Eradication and Sustainable Development (EUEI).

This workshop enjoyed the participation of high-level stakeholders from ministries, associations and scientific institutions. After the opening by the head of the EC delegation in Zambia and the director of the Zambian Department of Energy, an intense technical and political dialogue followed. This workshop coincides with the review process of the 1994 Zambian National Energy Policy. The thematic content of the workshop was divided into four strategic areas:

1. Current political initiatives in the field of renewable energy and their relevance to the current energy sector
2. The interaction of health and energy issues, particularly with respect to the areas of indoor air pollution, sanitation and energy supply for health infrastructure
3. Opportunities for liquid biofuels in Zambia, in particular in the form of petrol-bioethanol blending and biodiesel
4. The development and financing of small renewable energy enterprises, especially in rural areas

Alongside the workshop, a policy dialogue was held with the Minister for Science and Technology, the Minister for Agriculture and Cooperatives, the Vice-Minister for Energy, the Minister for Health, and the Minister for Education. The third day of the workshop consisted of a site visit to the Nakambala Sugar Estate of Zambia Sugar one of the most productive sugar estates in Sub-saharan Africa. (Please visit: www.partners4africa.org)

### A Platform for Continuous Dialogue is Established

The European Biomass Conference and Exhibition became a major platform for global dialogue and exchange of experience. This Conference, that also performed the first and the second World Biomass Conference, became an established framework for a continuous dialogue in the biomass sector.

## Worldwide Perspectives of Biodiesel Production and Utilisation *and* Review on the Results of the IEA Bioenergy Task 39 "Liquid Biofuels"

by Manfred Wörgetter and Dina Bacovsky, BLT Wieselburg – Federal Institute of Agricultural Engineering, Austria

**During the last decades, the evolution of the European biodiesel sector has been remarkable. While in 1980 the future importance of biodiesel was not even taken seriously, the overall production reached a total of nearly 1.2 Mio. tons in 2002. In the future, the newly released "Biofuels Directive" of the European Union asks for a market share of 5.75% biofuels in each member state by 2010. The permission of tax exemptions for biofuels will help to increase the production and utilisation of biodiesel in Europe.**

### *European Biodiesel Production*

The evolution of biodiesel within the last decades has been remarkable. Although in 1980 the research activities in the field of production and utilisation of oilseed derived products was not even taken seriously, trend reversal started in 1987 when France and Austria launched the commercialisation of biodiesel. Sponsored by public programmes, the first demonstration plants in Aschach (Austria), Compiegne (France) and Livorno (Italy) started production in 1988. While the biodiesel industry suffered from the decrease of crude oil prices at the beginning of the 1990´s, the rising energy prices in the past revived the biodiesel market and supported its further development.

In 2002, the European biodiesel production reached a total of nearly 1.2 Mio. tons, which is equivalent to an increase of more than 37% compared to 2001. With a total production of 550,000 tons in 2002, Germany became the leading biodiesel producer, overtaking France with an overall production of 350,000 tons. While in Germany, further investment increased the overall production capacity to about 1.1 Mio. tons per year, France retained the given quota of tax-free biodiesel. Unlike this, the German government does not impose any limits in terms of biodiesel volumes that can benefit from adjusted taxation. This supporting attitude is mainly driven by Germany's intention to secure employment, regional development and the intention to reduce global and local pollution. In the past, Italy has also increased its biodiesel production to 220,000 tons. Austria follows with a production of 30,000 t in 2002, whereas the production capacity has been increased to even 100,000 tons in 2004.

### *Biodiesel Utilisation*

In general, all commercially available diesel vehicles can be operated with a blend of biodiesel and regular diesel or even with pure biodiesel (B100). While the B5 blend performs very well, within the performance of B100, the automotive industry has strong objections. The most common arguments against pure biodiesel are the disruption of rubber materials and the potential negative influence of biodiesel viscosity and its distillation curve to the injection and combustion process.

In order to prove the beneficial utilisation of B100 and to develop suitable biodiesel vehicle technologies, several European countries carried out studies that included fleet tests with B30 and B100. The research and industry sectors cooperated in the development of quality parameters and national standards were established in France, Austria, Sweden, Italy, Germany and the Czech Republic. Instructed by the European Commission, finally European standards were elaborated at the European Standardization Organization (CEN). Hence, leading European manufacturers like Volkswagen were able to approve the use of high quality biodiesel as B100 in their vehicles. Meanwhile standards for biodiesel were also elaborated in North America, thus now the requirements for failsafe operation are given in all countries with high numbers of vehicles.

### *Future Potential of Biodiesel*

The new "Biofuels Directive", released by the European Union, requires a market share of 5.75% biofuels in each member state by 2010. Another complementary directive permits complete tax exemption of biofuels. As this is an indicative target, the member states are free in their way to achieve the goal. However, the member states are obliged to report progress and actions annually, including information on the reduction of $CO_2$ emissions.

While some member countries (e.g. Germany and Austria) will focus on biodiesel for the next years, the intension of other countries is not yet known, but will be evident when their reports to the European Commission are released. Besides biodiesel, the development and utilisation of bioethanol and biogas will be important, too. Additionally, there are programs that encourage the production of Fischer-Tropsch fuels in Germany, that may bring further amounts of biofuels onto the market by 2010.

While the driving forces for the implementation of biofuels (e.g. security of supply, regional development, reduction of pollution) are similar in Europe and North America, the actual markets are different. Whereas in North America mainly heavy-duty vehicles operate on diesel, in Europe diesel vehicles have been generally adopted for private transport. The European automotive industry has accomplished enormous progress in the development of diesel engines for passenger cars. The fuel consumption is very low, and because of turbo charging the engines are (almost) as powerful as conventional gasoline engines. The gasoline production is sourced out from Europe to North America, while the European refineries are interested in additional volumes of diesel fuels.

The Biodiesel Subtask of IEA Bioenergy Task 39 has carefully observed the development of oilseed derived fuels in the past period, and has elaborated three studies:

- A Worldwide Review on Biodiesel Production: The study defines the state of the world-wide development of biodiesel and is made in a modern form - a multitude of well arranged links offers the access to the comprehensive biodiesel web world.
- A Best Case Studies on Biodiesel Production Plants in Europe: This study gives a comprehensive overview on selected examples of the impressive European biodiesel industry. Data on companies, feedstock supply, installed technology, capacity, quality management and financial issues are included.
- A Review on Biodiesel Standardization World-wide: The study describes general aspects of the standardization process, important regulations and recommendations as well as the state of the standardization in Europe, North America, Australia and Brazil and reflects the actual state of the biodiesel standardization world-wide.

- Additionally, the Biodiesel Subtask has worked out a small study on the state of the development of rapeseed oil as fuel for farm tractors with interesting information on the situation in Germany.

These reports are available as a CD version, as well as on the Internet. For further information on the Biodiesel Subtask, please contact:

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## Liquid Biofuels in IEA Bioenergy

by Manfred Wörgetter and Dina Bacovsky, BLT Wieselburg – Federal Institute of Agricultural Engineering, Austria


The International Energy Agency was founded in 1974 as an autonomous body within the OECD to implement an international energy program in response to the oil shocks. Membership consists of 25 of the 29 OECD member countries. Activities are directed towards the IEA member countries' collective energy policy objectives of energy security, economic and social development, and environmental protection. One important activity undertaken in pursuit of these goals is a program to facilitate co-operation to develop new and improved energy technologies (www.iea.org). Activities are set up under Implementing Agreements. These are independent bodies operating in a framework provided by the IEA. There are 40 currently active Implementing Agreements, one of which is IEA Bioenergy.

IEA Bioenergy was set up in 1978 by IEA with the aim of improving cooperation and information exchange between countries that have national programs in bioenergy research, development and deployment. The work of IEA Bioenergy is carried out through a series of Tasks, each having a defined work program (www.ieabioenergy.com).

The extent to which biofuels have entered the marketplace varies by country. The reasons are complex and include policy and market issues. While biofuels offer significant potential, in most cases the prices of biofuels are higher than their petroleum equivalents. As a result, biofuels have been successfully implemented only in those countries that have recognized the value of benefits and have made appropriate policy decisions to support biofuels. (www.liquid-biofuels.com/FinalReport1.html).

The objectives of the past Task 39 “Liquid Biofuels” period (2001-2003) were to work jointly with governments and industry to identify and eliminate non-technical barriers which impede the use of fuels from biomass in the transportation sector, and to identify technological barriers to Liquid Biofuels technologies (www.forestry.ubc.ca/task39/). The Task was composed of 10 members (Austria, Canada, Denmark, European Union, Finland, Ireland, The Netherlands, Sweden, USA and UK) interested in working together for a successful introduction of biofuels. Under the leadership of the US Department of Energy this Task reviewed technical and policy issues. The overall goal was to provide participants with comprehensive information that assist them with the development and deployment of biofuels for motor fuel use.

The IEA Bioenergy Task 39:

- Provided information and analyses on policy, regulatory and infrastructure issues that help to encourage participants to establish the infrastructure for biofuels.
- Catalyzed cooperative research that will help to develop processes for converting lignocellulosic biomass to ethanol.
- Provided information and analyses on specialized topics relating to the production and implementation of biodiesel technologies.

Work was carried out in three subtasks:

- Policy, regulative and infrastructure issues to assist the implementation of liquid biofuels (Subtask leader: Dr. Don Stevens, Pacific Northwest National Laboratory (PNNL), USA)
- R&D&D issues used to expand the use of technologies that convert lignocellulosic material to ethanol (Subtask leader: Dr. Jack Saddler, University of British Columbia (UBC), Canada)
- Specialized topics and information exchange on biodiesel (Subtask leader: Manfred Wörgetter, Bundesanstalt für Landtechnik (BLT) Wieselburg, Austria)

Work is continued in the period from 2004 to 2006 under the leadership of Dr. Jack Saddler from the UBC in Canada (www.forestry.ubc.ca/task39)

## The Farmer as Energy Producer

by Dr. Heinz Kopetz, Chairman Austrian Biomass Association

**Renewable energy sources will be the core of energy scenarios with biomass playing a crucial role due to its large potential and flexibility. In future, farmers and forest industries will not only produce food, feedstock and wood, but also offer raw materials for energy production, as well as final energy services.**

The energy system of the industrial world is mainly based on fossil fuels and nuclear power. These systems of energy supply however, cannot offer long term perspectives for the future. The upcoming shortage of supply of oil and gas within the next decades and the global warming caused by burning fossil fuels will be the driving forces in favour of a fundamental change of the actual energy system. We just enter a transition period to a new supply pattern of energy.

In future, renewable sources of energy will be the core of upcoming energy systems. Within the available renewable energy resources, biomass will play a crucial role as it has the biggest potential and flexibility. Biomass can be transformed to heat, electricity and fuels for transport.

In the future, farmers and forest industries will not only produce food, feedstock and wood, but also offer raw materials for energy production, as well as final energy services. The future development includes two possible strategies:

### Final energy production

In this strategy, the farmer transforms available raw material to final energy products such as heat, electricity or transport fuels. The production of the raw materials as well as the final energy transformation will be the new activities to be included into the conventional agriculture.

Therefore, it will be necessary to set up heating plants, biogas plants or wood gasification systems in order to produce and distribute electricity to the public grid and to use the heat for various heat consumers. The same principal applies to the production of fuels for transport purposes. The transformation of available vegetable oil through esterification offers the opportunity to produce and sell biodiesel.

In many European countries there are already projects that demonstrate how farmers get involved in this new energy business. The decentralised regional development brings benefits to the farmers and the whole region. However, it is necessary to implement education programs and financial grants for the necessary investments.

One example for this kind of development is the energy cooperative of Mureck in Styria, Austria. About ten years ago, a group of 400 farmers founded a cooperative in order to produce biodiesel on the basis of rape seed and used cooking fat. At present they produce about 7,000,000 litres of biodiesel per year for their farms and other commercial users.

Furthermore, the energy cooperative, together with other farmers founded a second company that operates a district heating plant of 4 MW capacity in order to deliver heat to the city of Mureck. Recently, their newly founded company set up a biogas plant of 1 MW. The produced electricity is sold to the grid while the occurring heat is delivered to the district heating system. The by-products of the biodiesel plant are used in the biogas plant for the production of electricity.

This energy cooperative supplies heat, electricity and biodiesel in a quantity that makes the rural community self-sufficient. Furthermore, about 15 new jobs have been created. The energy circle of Mureck demonstrates in a trend-setting way the new opportunities of farmers within the energy business.

**Production of energy raw materials**

The second approach includes only the production of energy raw materials such as rapeseed for biodiesel, cereals or corn for bioethanol, wood logs or wood chips for heating plants and cogeneration plants.

Public utilities, international energy companies or other private companies are constructing and operating the plants in order to transform the energy raw materials to electricity, heat and transport fuels. Therefore, the farmers does not have to get involved in constructing and operating energy plants.

While the first approach brings more risks but also more benefits for the rural communities and the single farm, the second approach opens rather huge new markets for agriculture. In the future, both approaches need to be considered and realised, depending on regional prerequisites agricultural structures, energy needs and governmental policies. In any case, the “Farmer of the Future” will play an important role in a new sustainable energy system, that step by step will reduce the present dependence on oil and gas.

Bioenergy production and final energy services

## Development of a Hydrolysis Process for the Production of Ethanol from Bagasse

by Dr. Carlos Eduardo V. Rossell, Copersucar Center of Technology, Brazil

**In order to continue the development of the promising Dedini Rapid Hydrolysis Process (DHR), the Copersucar Center of Technology (CTC) and Dedini S/A settled a cooperation agreement in 1997. Currently, the process design for a commercial DHR unit, is prepared and evaluated. The DHR process promises a yield of about 12,000 liters ethanol per ha of integral cane, which is almost double the current yield of 6,400 liters of the traditional process.**

In 1997, the Copersucar Center of Technology (CTC) and Dedini S/A settled a cooperation agreement with the aim of continuing the development of the Dedini Rapid Hydrolysis Process (DHR) in order to hydrolyze and convert the sugars available in bagasse to ethanol.

Bagasse is the final biomass residue that is available in large amounts, after extracting the sucrose juice of the sugar cane. In its composition, it is similar to hardwoods, being a complex of cellulose, hemicellulose and lignin. Due to this complex structure, sugar units from cellulose are not readily available for fermentation to ethanol or the production of any other chemicals. The process to be developed deals with the conversion of polymeric carbohydrates of bagasse to pentose and hexose monomers.

The chemical decomposition of highly complex cellulose structures includes several prerequisites, such as appropriate conditions of temperature, pressure and acid concentration. At these extreme conditions, a large quantity of the sugar monomers is destroyed, diminishing the yield of the process.

The Dedini Rapid Hydrolysis Process (DHR) introduces a solvent in order to dissolve lignin and to change the structure of the cellulose-hemicellulose-lignin complex. The required chemical reactions can then be accomplished at a lower temperature and pressure, while the saccharification reaction is faster and sugar decomposition can be minimized.

The pilot unit was projected to study and optimize the conditions for the conversion of cellulose and hemicelluloses to low molecular weight sugars (pentoses and hexoses) in order to collect engineering parameters and to determine the technical and economic feasibility of the DHR process.

In the pilot unit, raw bagasse is continuously fed into a process reactor where it is treated with sulfuric acid as a catalyst, diluted in a mixture of water and an organic solvent (ethanol). The chemical reaction takes place - lignin is dissolved and hemicellulose as well as cellulose are saccharified. Immediately after the reaction time has elapsed, the liquor is flash-cooled in order to avoid decomposition of reaction products. Furthermore, some by-products are recovered at this stage of the process.

The liquor is fed into a distillation tower where the solvent is removed and returned to the process. The stream of sugar liquors and the lignin are recovered at the bottom of the distillation unit. The collected sugar liquors need to be clarified, concentrated and removed from fermentation inhibitors.

With this final sugar liquor, the conversion of bagasse hexoses to ethanol is accomplished by fermentation, followed by distillation to ethanol. At the first stage of the process, only the hexoses are intended to be fermented to ethanol. Within the second step, the conversion of the pentoses to ethanol (or other chemicals) will be considered. The residual lignin will be burned to sustain the energy demands of the process. Other applications for the lignin will be considered in the future.

The process design for a commercial unit based on DHR technology is currently prepared and evaluated in order to plan the next steps of the project. The benchmark to turn this process feasible, is a yield of about 12,000 liters ethanol per ha of integral cane. This will almost double the current yield of 6,400 liters of the traditional process for sugarcane based ethanol production.

## Challenges and Opportunities for Small-scale Bioenergy Technologies in Developing Countries

by Dr. Grant Ballard-Tremeer, Eco Ltd, London, UK

**While in the past, the utilisation of wood, charcoal and other forms of biomass was efficient for cooking and heating purposes in developing countries, the clearing of forests for farm land, timber and fuel today has drastically decreased the availability. It is therefore necessary to implement measures that can help to mitigate the negative impacts of traditional biomass utilisation, while recognising the significant benefits of this energy resource. These measures include advanced small-scale biomass technologies such as improved biomass and biofuel burning stoves.**

### The challenges

While the percentage contribution of the traditional use of biomass to total primary energy is decreasing steadily (in Africa the contribution has decreased from 62% in 1971 to 49% in 2001 – IEA 2003), this masks the real situation behind the rapid growth of other fuels. According to the International Energy Agency (IEA), the number of people worldwide using biomass is set to increase 10% from 2,390 million in 2000 to 2,628 in 2030. The projected growth over the same time period in Africa is 27% (from 583 million in 2000 to 823 million in 2030). Despite massive efforts and expenditure to electrify rural areas it is clear, that the absolute number of people using biomass for cooking and heating is set to increase substantially in the coming years.

The traditional "three-stone stove" is still the most common cooker in Africa - even though it is very inefficient and therefore, most of the potential energy is wasted. The inefficient combustion also leads to high levels of smoke gas emissions that causes the deaths of 1.6 million people every year. Statistically, every 20 seconds someone - usually a child or mother - dies from illness caused by household smoke (ITDG 2004).

### The opportunities

There are a number of possible measures that can help to mitigate the negative impacts of traditional biomass utilisation, while recognising the significant benefits of this ubiquitous renewable source of energy. These measures include:

- Implementation and promotion of advanced small-scale technologies
- Low-cost solutions for household and large-scale cooking
- Promotion of energy-efficient food preparation techniques
- Utilization of other renewable energy sources

### Sustainable and integrated approaches

The sustainable and integrated approaches are focused on the creation and enhancement of business models, required to increase the range of options of households. These approaches include:

- Awareness raising amongst bioenergy users
- Creation of business opportunities for stove suppliers
- Establishment of supporting frameworks and policies
- Networking and formation of bioenergy partnerships

Household energy programmes can potentially have significant impacts, such as:

- The production and marketing of improved technologies results in additional job creation and money savings.
- Women are generally targeted and empowered through training programmes and via extension services. As a result many women get involved in stove production and subsequently increase their income. Furthermore, the knowledge and skills they acquire through the training improve their self-esteem and empower them to get involved in their communities.
- Energy efficient technologies reduce air pollution and the risk of respiratory diseases for both women and children. In addition, improved stoves can reduce fuel expenditures and work burden for fuel collection.
- The use of more energy efficient technologies and other renewable energy sources can reduce the overall $CO_2$ emissions.

For further information please visit:
HEDON Household Energy Network – www.hedon.info
Sparknet – www.sparknet.info
ProBEC (Programme for Biomass Energy Conservation) www.probec.org.

## EUBIA, the European Biomass Industry Association coordinates 25 partners of the BIOPROS project

by Dr. Giuliano Grassi, European Biomass Industry Association (EUBIA)

**Due to the increasing cost pressure on agricultural products, the economic situation of European farmers deteriorates constantly. The foreseen decoupling of subsidies from fixed production rates will further amplify the decline of prices. A significant potential for alternative income arises from agricultural production of wooden biomass in so called multifunctional Short-Rotation-Plantations (SRP).**

The economic situation for European farmers deteriorated constantly during the last decade because of increasing cost pressures on agricultural products. In 2003 the agricultural sector again was suffering from a 20% reduced income causing an increasing number of farmers to have serious economic problems or to even have to abandon their business. The foreseen decoupling of subsidies from fixed production rates will lead to further price deteriorations especially for food products and will aggravate the difficult situation for agricultural SMEs. By including the 10 new Member States this development concerns more than 11.9 million agrarian enterprises in the EU25 (most of them are SMEs). Instead of price stability future EU subsidies are meant to strengthen farmers' role in rural development and fulfilment of quality standards for environment, animal protection and food security. To be competitive, farmers throughout the EU are obliged to adapt their business activities in terms of alternative products and general quality requirements.

Short-Rotation-Plantations (SRP) with 3 year old willows

A huge potential to provide farmers with significant alternative income arises from agricultural production of wooden biomass in so called multifunctional Short-Rotation-Plantations (SRP). In particular fast growing tree species (currently mainly willows and poplars) can be cultivated under application of wastewater and/or sewage sludge for irrigation and fertilisation. The application of these resources avoiding water stress can increase annual yields up to 2 times to about 12-17 t of dry matter/ha/y. So the income for SRP farmers emerges from both high production of wood biomass and from biological treatment of the applied "human wastes" by the crops' nutrient and water demand.

Market prices for wood biomass will raise in parallel with the fast growing biomass demand for wood-chips, wood-pellets for heat power, biofuels production and other industrial products. However, apart from the economic biomass potential, main benefit for SRP farmers can result from the wastewater and sludge treatment performance in the plantation.

The potential of each resource thereby depends on local treatment situation and local growing soil characteristics. In areas with high connection rates to modern treatment facilities the potential of SRPs arises from its flexibility and adaptation to wastewater or sludge application. Effluents from wastewater treatment plants can efficiently be used for irrigation by avoiding direct discharge and providing an additional biological treatment step. Sludge, as a residue from wastewater treatment procedure can be used for SRPs fertilisation. In areas with low access to modern treatment facilities, like especially in dispersed rural regions in the New Member States and Candidate Countries, SRPs will be a low-cost alternative for the construction of cost intensive high standard treatment technologies.

The main objective of the BIOPROS project is to gain sufficient knowledge by conducting R&D activities on optimal SRP operation, the identification of potential markets, the transfer of knowledge and the dissemination of knowledge and results. Beside the analysis of the different regional potentials and the improvement of operational knowledge the project work will have a main focus on full environmental and hygienic SRP compatibility to existing legislation. R&D results will be transferred into standards for best SRP practice and further appropriate training and dissemination tools like SRP guidelines containing general and specific regional aspects. Thus, BIOPROS will contribute to promote SRP biomass production between SMEs throughout Europe and abroad to improve their economic situation.

## China's Worldwide Cooperation in the Field of Biogas

by Heinz-Peter Mang, Chinese Academy of Agricultural Engineering (CAAE), Institute of Energy and Environmental Protection (IEEP), Beijing, P.R. China

**China´s history of biogas utilisation started in 1936 when the first biogas digester was built in Jiangsu. In the last decades, Chinese biogas experts have supported the development of biogas programmes and projects in a variety of developing countries. Thereby, Chinese institutions are committed to play a lead role in networking and information exchange to ensure that the potential of biogas technology is recognized and made optimal use of worldwide.**

The history of biogas exploration and utilisation in China covers a period of 70 years. A fixed dome biogas digester was built in Jiangsu, China as early as 1936, and since then considerable research has been carried out in China on various digester models. The same year, China established the Chinese Academy of Agricultural Engineering (CAAE) and started the preparation of a rural fertilizer and energy policy. The fixed dome water pressure digester was developed in the 1950s. In terms of absolute numbers, the improved fixed dome is today the most common household digester type in Developing Countries around the world. Since the 1970s biogas research and technology were developed at a high speed and biogas technology was promoted vigorously by the Chinese government.

In the late 1970's, triggered by Schuhmacher's 'Small is Beautiful', appropriate technologies entered the arena of development work in the South. Not Northern high-tech, but innovative, affordable, simple and traditional technologies, were seen as the remedy for the development- and technology-gap between industrialized and developing countries.

Following its launching in 1980, the German Agency for Technical Cooperation (GTZ-GATE) chose biogas technology as a focal point of its appropriate technology activities. The first experience showed that industrialized countries neither had sufficient experience nor appropriate technologies to build on in developing countries. Rather, this experience was identified in India and China and transmitted by a South-North-South transfer. The term 'appropriate technology' seemed justified by the fact that this technology was adapted to the respective local conditions during a 'learning-with-developing-countries' process.

This resulted in a cross-sectoral scheme that has been accompanying and supporting the development and dissemination of biogas technology in Latin America, Asia, Africa and the Pacific Region. Germany started with Nepal in 1976, Cameroon in 1978 and India and China in 1979. Also since 1979 – started with a first Chinese-Philippine biogas cooperation initiated by the United Nations Development Program (UNDP) - the Chinese government has provided multilateral biogas assistance to 92 countries and international organizations in Asia, Africa, Middle-East, East-Europe, Middle and South-America, and South-Pacific regions. For example: in 1980, the Planning Research and Action Division based in Uttar Pradesh, Northern India, developed the 'Janata' fixed-dome plant, which was inspired by the technology used in China; the know-how was transferred by exchange visits of Indian and Chinese experts, jointly organized with German experts.

Chengdu Biogas Research Institute, was established in 1979 to suit the needs of the biogas development in China, which goes on in the responsibility of the Ministry of Agriculture. The Chengdu Biogas Research & Training Centre for Asia and the Pacific (BRTC) was absorbed in 1981 in this Institute in accordance to an agreement between UNDP and the Government of China. Up to now, BRTC has organized more than 30 international biogas training courses and many national courses participating 570 trainees from 85 countries and over 2000 biogas technicians from the Chinese provinces, municipalities and regions.

Chinese biogas experts have been and are sent abroad to assist in biogas technology within the Chinese international cooperation framework, so in Bangladesh, Benin, Brazil, Burundi, Cuba, Ethiopia, Guinea Bissau, Lesotho, Nepal, Rwanda, Thailand, Tunisia, Uganda, Vietnam, Vanuatu. Several projects have been conducted in cooperation with German or European biogas experts, as in Burundi (1982 - 1989), Tunisia (2002), Nepal (1997) and Cuba (1998).

China, India, and Nepal have conducted main biogas programs (Nepal supported by The Netherlands and Germany); all three countries now have large manufacturing industries for household biogas plants. Today, farm-based anaerobic digestion facilities are the most common. Seven to nine million family-sized, low-technology digesters provide biogas for cooking and lighting fuels and a better sanitation in rural China with varying degrees of success. However, the number of operational biogas plants may have declined considerably in the mid-1990s.

China's extensive biogas programs began in the mid-1950s and reached peaks in both 1960 and 1979. Inadequate education and training of households led to technical failures and declining use subsequent to each new program. Since the mid-1980s, a network of rural biogas service centres was established to provide the necessary infrastructure to support dissemination, financing and maintenance.

In China and India, there is a trend towards using larger, more sophisticated systems with better process control to generate electricity. At the same time as both biogas leading countries offered worldwide biogas cooperation for rural energy, decentralized wastewater treatment and ecological sanitation, both countries also seeking international cooperation to improve their up scaled technology systems. It is recognized by Chinese experts that Germany is the today leading country for biogas combined heat and power (electricity) generation (CHP) systems. Biogas as pseudo natural gas (PNG) is best developed in The Netherlands and biogas for vehicles technology (CBG) is leaded by Sweden. Engineering of up scaled biogas process should be further developed in a multilateral cooperation between and with these countries of main biogas experience.

However, the highest degree of market maturity of anaerobic technology can be found in the sector of municipal sludge treatment, industrial wastewater purification and treatment of agricultural wastes. In municipal wastewater treatment the technology is currently experiencing an upswing in Asia and Latin America, while the anaerobic treatment of municipal organic waste is experiencing a boom in Europe. Agricultural biogas plants in developing countries are usually promoted on a large scale in connection with renewable energy and environmental issues, together with improved energy services, and are installed particularly where water pollution through liquid manure from agriculture is most severe. The increasing emission of greenhouse gases, increasing water consumption and water pollution, declining soil fertility, unsatisfactory waste and waste water management and the growing rate of deforestation must be seen as parts of the unsustainable resource use systems that prevail worldwide. Biogas technology is one of the important hardware components in a chain of measures to counteract the above problems. Chinese institutions are committed to play a lead role in networking and information exchange to ensure that the potential of biogas technology is recognized and made optimal use of. Other influencing factors are local environmental regulations and policies on land use and waste disposal. Because of these environmental pressures, many nations have implemented or are considering this technology.

As an example, large scale use of biogas in Chile could be one of the energy solutions and is already in use as landfill gas extraction in the Santiago Metropolitan Region and in the Region 'Bio-Bio'. This projects are supported by the University of Chile and some municipalities. The first large scale farm units have been installed and Climate Change Project Services are used as financing source. For developing countries there are new ways of cooperation with China, India and Europe.

Chinese-Tunisian-German Biogas Training in Tunisia

## Employment Potential of Renewable Energy in South Africa

by Greg Austin, AGAMA Energy (Pty) Ltd, South Africa

**Within the next few years the South African energy economy will strongly require new energy capacities. Historically, South African employment levels in the energy sector have declined despite increased production levels. This trend is particularly the case in the electricity sector where employment levels have halved over the past two decades, while electricity production has doubled. In order to reverse this trend, renewable energy technologies can offer a quantifiable potential for creating and sustaining new and decentralised employment in South Africa.**

The South African energy economy strongly requires new energy capacity. Current projections indicate, that electricity demand will outbalance the baseload capacity within few years. Historically, South African employment levels in the energy sector have declined despite increased production levels. This trend is particularly the case in the electricity sector where employment levels have halved over the past two decades, while electricity production has doubled.

In order to reverse this trend, renewable energy technologies can offer a quantifiable potential for creating and sustaining new and decentralised employment in South Africa. Within this however, the most important prerequisite is that South Africa sets a higher target for Renewable Energy. Currently, the Government's White Paper on Renewable Energy only includes a general role of Renewable Energy Technologies (RETs), the extent to which this policy is implemented however, depends on relatively loose commitments. For example, the commitment includes the contribution of 10,000 GWh Renewable Energy to the final electricity consumption by 2012. This cumulative target however, only corresponds to 0.15% of the projected electrical generation output in 2012.

If the current Governmental commitment would be increased to an overall renewable electricity contribution of 15% in 2020, about 36,400 direct jobs in the South African economy could be created. In comparison with the targets of other countries around the world however, even this valorised commitment would be minor. Within the overall Renewable Energy sector, the direct job creation of the biofuels sector is most promising. The implementation of a 15% ethanol and biodiesel substitution could create 350,000 direct jobs in 2020. The following table shows the potential job creation of selected Renewable Energy sources in 2020.

| Technology | Direct Jobs | Indirect jobs | Total jobs |
|---|---|---|---|
| Solar thermal | 8,288 | 24,864 | 33,152 |
| Solar PV | 2,475 | 7,425 | 9,900 |
| Wind | 22,400 | 67,200 | 89,600 |
| Biomass | 1,308 | 3,924 | 5,232 |
| Landfill | 1,902 | 5,706 | 7,608 |
| Biofuels | 350,000 | 350,000 | 700,000 |
| **TOTAL** | **386,373** | **459,119** | **845,492** |

These figures represent a conservative assessment of the total technical employment potential of the industries concerned. As the employment opportunities in the RE sector generally are in contrast to the declining trend of employment levels in the coal-based generation sector, the deployment of RETs can slow down the overall losses in employment in the energy sector as a whole.

For the full report 'Employment Potential of Renewable Energy in South Africa', elaborated by AGAMA Energy (Pty) Ltd, Sustainable Solutions and Earthlife Africa please contact:

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## Swedish Cellulose Ethanol Pilot Plant is now under Start-up

by Jan Lindstedt, BioAlcohol Fuel Foundation, Sweden and Gunnar Fransson, Etanolteknik (Etek), Sweden

**Softwood is the feedstock with the biggest potential for ethanol production in Sweden and other northern countries. In order to develop the technology for ethanol production from soft wood residues, the company Etanolteknik has established the process design of a cellulose ethanol pilot plant. Start up of the first parts of this plant was in December 2003 and the Swedish prime minister participated in the inauguration ceremony on the 26 of May 2004.**

Likewise to many other countries, ethanol is the most widespread alternative to gasoline and diesel in Sweden. The country has 400 buses running on neat ethanol, about 8,000 Ford Focus Flex Fuel running on E85, and about 1,500,000 cars running on E5. Therefore, it is essential to develop the whole chain from raw material harvesting to ethanol production and distribution. Furthermore, the utilisation of ethanol should include a consideration of tax exemptions and support mechanisms.

Softwood is the feedstock with the biggest potential for ethanol production in Sweden and other northern countries. The residues from harvesting, sawmills, and other wood based production units can be used. Hard wood residues and cultivated energy crops (mainly willow and reed canary grass) may also be an interesting feedstock for ethanol production in Sweden.

Up to now, the BioAlcohol Fuel Foundation (BAFF) has executed ten feasibility studies in Sweden, integrating ethanol production with municipality power plants, sawmills, pulp mills, wood pellets plants etc. The outcome of these feasibility studies proves, that ethanol can be produced at a cost of about 45-55 Eurocent per litre.

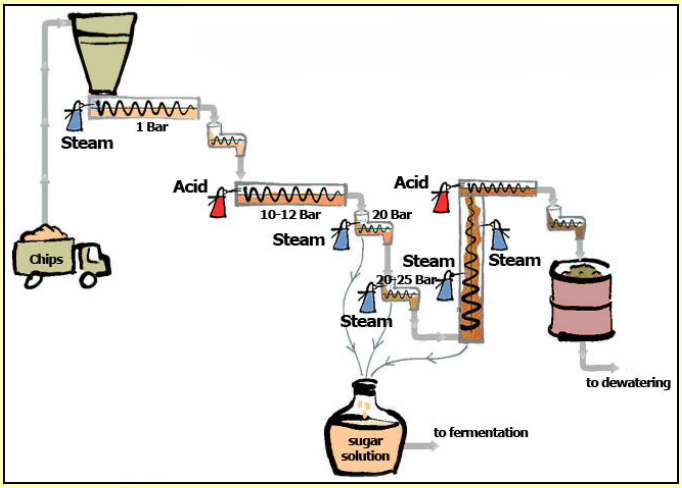
The development of ethanol production from cellulose raw material has been going on for 15 to 20 years at different Universities in Sweden. Several process alternatives for the hydrolysis of cellulose materials have been evaluated. Diluted acids and the inclusion of a third enzyme seems to be the most suitable for softwood to get high yields of ethanol. Based on the results of the bench scale unit at the Technical University of Lund, the next step is to verify and optimise the process, through the implementation of a pilot plant.

### Cellulose Ethanol Pilot Plant

In order to develop the technology for Ethanol production from soft wood residues, the company Ethanolteknik has established the process design of a cellulose ethanol pilot plant.

The pilot plant will be linked to three Universities in the region (University of Umeå, Mid Sweden University, Technical University of Luleå), while the management team of Etek will be supported by a scientific advisory board, headed by Prof Guido Zacchi. Located in Ornskoldsvik, 500 kilometres north of Stockholm the pilot plant will have a capacity in feedstock input of about 2 tons of dry substance/day, while the expected yield of production will reach 400-500 litres of Ethanol per day.

The plant is basically designed for the development of the continuous diluted acid hydrolysis process in two steps with a third step for enzymatic hydrolysis and for softwood residues as cellulose material. The second step in the reactor is a countercurrent reactor which has a good potential to increase the yield and reduce the amount of byproducts.




Schematic design of the 2 steps countercurrent reactor

As catalyst for the hydrolysis, diluted sulphuric acid or sulfur dioxide will be used. The second step, the countercurrent reactor, can be changed to a co-current reactor to test the different technologies. The fermentation will be able to run in batch, fed-batch or continuously.

The pilot plant will be a complete industrial plant with all unit operations like hydrolysis, dewatering, fermentation, distillation and recycling of process streams. In order to identify long-term effects on deposits and build up of circulating byproducts, the pilot plant will be operated 24 hours per day in periods of 3 to 4 weeks. A one week stop between the running periods is calculated for cleaning, equipment replacement and evaluation.

Start up of the first parts of this plant was in December 2003 and the Swedish Prime minister participated in the inauguration ceremony on the 26 of May 2004. To verify the process and technology and to get more accurate design data for production plants, Etek needs to operate and evaluate the pilot plant for about two years, before they design a demonstration plant with an increased capacity of 30-60 Million litres/year.

**Financing of the pilot plant**

The basic design of the pilot plant, the study of a full scale production plant and the investment in the pilot plant have been financially supported by the Swedish Energy Agency, regional EU-funds, county governments, regional energy and private companies. The investment costs of the pilot plant is about 17 million Euro and the annual running cost about 1.5 - 2 million Euro, depending on the included research program. The existing infrastructure of the close-by sulphite pulp ethanol plant, valued to 5-6 million Euro was also used.

***Further development of the pilot plant***

Etek has started with the diluted acid process but strives to develop an enzyme process for soft wood together with enzyme producers. In the future, different feedstock and annual crops will be tested in the pilot plant that will be open for cooperation with partners from Europe and other countries.

## Brazil Faces the Challenge of a New Energy Paradigm

by Antonio René Iturra, Ministry of Science and Technology, Brazil and Paulo César Ribeiro Lima, Energy Consultant of the Brazilian Federal House of Representatives

**In order to ensure the energy supply of a worldwide growing demand, it is becoming more and more relevant to find new strategic solutions, as almost all future energy scenarios are forecasting energy crises that are caused by supply shortages and not by political and market issues like in the past. Therefore, it is important to discuss the qualitative and quantitative fuel sources under a new paradigm that focuses on clean, efficient and renewable energy sources.**

Nowadays, it is becoming more and more relevant to find new strategic solutions in order to ensure the energy supply in a worldwide growing demand. Almost all future energy scenarios are forecasting energy crises, caused by supply shortages and not by political and market issues like in the past.

Therefore, it is important to discuss the qualitative and quantitative fuel sources under a new paradigm that focuses on clean, efficient and renewable energy sources. The production and utilisation of liquid biofuels will become the most important part of the future energy mix.

Due to Brazil's inadequate coal reserves (high ash content and low calorific value), it is necessary to import the coal, needed for the country's industry. Until the 1990´s even a great percentage of oil was imported. Today, Brazil imports about 15 percent of the national consumption, i.e. 1,800 barrels per day. By the end of 2006, the increase of Brazil's oil production should be sufficient to reach self-sufficiency. This however could be a threat to the development of alternative energy sources, as the self-sufficiency may result in a weakening of necessary activities within future ethanol and biodiesel production.

As the world's leader in fuel ethanol, Brazil now focuses on the production and utilisation of biodiesel. With Directive 702 of the Ministry of Science and Technology (MCT), Brazil has implemented research and technology development activities for a national biodiesel program. In 2003, an Interministerial Workgroup evaluated the feasibility of biodiesel in Brazil and set recommendations for a biodiesel program. After the implementation of the first biodiesel specifications (ANP 255/03), the country in 2004 set the permission to utilise 2 percent biodiesel admixture to regular diesel (B2). Finally, on 6 December 2004 Brazil's National Biodiesel Program PROBIODIESEL was announced. The program aims to develop technology for the production, utilisation and industrialisation of biodiesel.

In the past, Brazil's consumption and imports of mineral diesel have been rising rapidly. According to the country's legislation, Brazil wants to reduce its dependence on diesel imports, as it has already successfully been done with petroleum through the PROÀLCOOL program.

Brazil has several crops can be used for biodiesel production, including soybean, palm, coconut, castor seed, cotton seed and sunflower. Today, soybeans account for the vast majority of Brazilian oilseed production and therefore present the most viable option for a national biodiesel industry. The current Brazilian administration considers that the Brazilian PROBIODIESEL program brings further social inclusion and job creation. Even though Brazil's biodiesel program is still in its infancy, it offers great potential for the future. More information on the PROBIODIESEL program is available at www.biodieselbrasil.com.br.

## Bioenergy Opportunities in Venezuela

by Dr. Evanan Romero-Gutierrez
Fundacion Momento de la Gente – FMG, Venezuela

**Venezuela has ideal prerequisites to exploit its abundant biomass resources. The promotion of non-fossil fuels for local consumption is fully in line with Government guidelines as it will help to alleviate environmental problems and support the creation of new jobs in rural areas.**

Venezuela is the fifth largest exporter of oil worldwide and has been in the top list of exporters since the early 1930's. Besides its abundant conventional energy resources, Venezuela has ideal prerequisites to replicate the experiences regarding bioenergy utilisation, such as the bioethanol program, implemented in Colombia. The promotion of non-fossil fuels for local consumption will include the alleviation of environmental problems as well as on the creation of employment.

The rural communities of the Peninsula de Paria and the Orinoco in Venezuela will derive immediate and sizable benefits. Besides significant job creation for unskilled workers, the utilisation of biomass will improve the social and economic conditions of isolated rural communities. The utilisation of specially designed smoke-free stoves will help to reduce fuel costs and wood consumption up to 40 percent, while the emissions are reduced by 30 percent. The construction of small scale pellet plants could use the available agricultural bagasse, wood chips and other waste to compact and store the biomass.

The Fundacion Momento de la Gente is currently promoting these projects among the involved energy corporations. It is most likely that the government will fully support this project, since it corresponds with the envisioned guidelines to create new local jobs, reduce the consumption of fossil fuels and to mitigate the poverty and health problems of rural areas in Venezuela.

## *Recent Events:*

### LAMNET Workshop in Venezuela

In order to promote the benefits of innovative biomass technologies for applications in Venezuela, the LAMNET network and its national partner Fundacion Momento de la Gente (FMG) organised a seminar in October 2004 in Caracas.

A large group of agro-industrial firms, academia, business promoters, government officials, elected members of Congress, media, NGOs, engineering and environmental consultancy firms, and general public gathered for one day to review and engage in a fruitful discussion on the opportunities offered by bioenergy applications in Venezuela.

from left: Dr. G. Grassi, EUBIA, Prof. J. R. Moreira, CENBIO, Dr. E. Romero-Gutierrez, FMG

The main topic of this workshop was to review the most promising applications for biomass utilisation in Venezuela, which were introduced by Dr. Evanan Romero, LAMNET representative on behalf of FMG. This presentation gave statistics related to the inventory of opportunities for application of biomass technologies that could mediate urgent needs of environmental pollution of urban solid waste, animal manure and vegetable residues which have a potential to produce an energy equivalent of 70,000 barrels of oil or one tenth of the country's total daily hydrocarbon consumption.

Dr. Peter Grimm of WIP, Germany presented an overview of innovative technologies being applied in Europe and worldwide, particularly in the Far East, Africa and Latin America.

Dr. Giuliano Grassi of the European Biomass Industry Association - EUBIA, presented topics related to pelletization of biomass and offered opportunities for cooperation with European industries in developing countries.

Professor José Roberto Moreira of CENBIO in São Paulo, Brazil presented the impressive development that Brazilian industries have achieved in the large scale commercial production of ethanol as a fuel now standing at 15 billion liters per year.

Finally, Dr. David Cala-Hederich of Corpodib, Colombia explained how a country with agricultural resources, climate, culture and other conditions quite alike to the ones prevailing in Venezuela set a goal of promoting biomass applications in large commercial scale. Today, after 10 years of effort in the field of bioenergy development, Colombia is implementing bioethanol production facilities for the introduction of ethanol-gasoline blends into the national fuel market. Additionally, great progress has been achieved in rural biomass applications in order to solve the energy needs of remote communities not supplied by the conventional energy grids.

All presentations given at the LAMNET workshop in Caracas are available at www.bioenergy-lamnet.org.

## LAMNET International Workshop on Bioenergy Policies, Technologies and Financing, Riberão Preto, São Paulo, Brazil

The LAMNET Project Workshop "International Workshop on Bioenergy Policies, Technologies and Financing" took place in Riberão Preto, São Paulo, Brazil, from September 14th to 17th, 2004. The workshop was attended by 110 participants from the academic, non-governmental, official, social, and private sector. A variety of scientific contributions, and presentations were prepared by LAMNET Members and invited speakers. The special focus of this workshop was on biodiesel production and utilisation in Brazil, as well as on the further promotion of Flex Fuel Vehicles. Besides the symposium, the workshop included a guided visit to the International Sugar and Alcohol Industrial Fair (FENASUCRO), as well as a technical tour to the sugar and energy production facility Companhia Energética Santa Elisa.

### Biodiesel Production and Utilisation in Brazil

Due to the high relevance of future biodiesel production and utilisation in Brazil, this topic was addressed in the view of technical, strategical and political aspects. The huge biomass potential, good climatic conditions, as well as the technical capability of Brazil makes the implementation of a nationwide biodiesel program most likely. In January 2004, President Luis Ignacio Lula underlined the importance of biodiesel production and utilisation, and promised support for the creation of a National Research Center on Biodiesel. In addition to its contribution to national security of supply, a nationwide biodiesel program could create about 200,000 new jobs in rural areas.

### Flex Fuel Vehicles

Recently, Flex Fuel Vehicles (FFV) have gained much interest from various car manufacturers, ethanol producers and end consumers. The recent development of the FFV market in Brazil has been impressive. Starting from a market share of only 0.3% in 2002, sales figures have reached about 30% in 2004. While currently 21 different FFV models are available, future scenarios expect that by the year 2010 almost all vehicles in Brazil will be driven by Flex Fuel Technology.

The possibility to use any blend of gasohol (regular gasoline with ethanol) leads to a unique fuel flexibility that is very attractive for consumers. Furthermore, the increased ethanol demand stimulates production and further investment in the ethanol sector. The currently available Flex Fuel Vehicles are technically gasoline-based, which leads to less fuel efficiency. In the future however, vehicle manufacturers need to increase the energy efficiency and performance by introducing improved engine modifications.

### International Sugar and Alcohol Industry Fair (FENASUCRO)

FENASUCRO is the main event in the sugar and ethanol sector worldwide. Since 1993 the event brings together suppliers of equipment and services for sugar mills as well as alcohol and sugar distilleries. The aim is to stimulate the technological development, encourage the trade and give an impulse for future business. FENASUCRO 2004 was attended by 320 exhibitors who presented the whole spectrum of technologies and services, related to the sugarcane and ethanol industry. About 35,000 visitors from Latin America and other countries of the world visited the event.

Participants of the guided visit to FENASUCRO

### Technical Tour - Companhia Energética Santa Elisa

The LAMNET workshop in Riberão Preto included a technical tour to the Companhia Energética Santa Elisa, a sugar production facility that started production in 1933. After continuous development and expansion, today, the Santa Elisa plant employs 4,000 workers. The annual production reaches 500,000 tons of sugar and 210 million litres of alcohol.

In Mai 2003, President Lula inaugurated the company's new thermal plant that produces 60 MW of electricity per hour. Thereof about 30 MWh are transferred to the utility company serving 500,000 households with electricity. A significant increase in the sugarcane bagasse based electricity generation is realised through the introduction of innovative high-pressure boilers feeding two high temperature and high pressure multistage turbines of TGM-Turbinas operating at 510°C with an inlet pressure of 63 bar. This new line of turbines is especially designed and manufactured in order to improve efficiency levels in conventional or combined thermal cycles. Compared to the harvesting period 2002/2003, the electricity generation was quadruplicated when the new thermal plant was put into operation.


High pressure boilers at the Companhia Energética Santa Elisa

All presentations given at the LAMNET workshop in Riberão Preto are available at the LAMNET website www.bioenergy-lamnet.org.

## LAMNET Workshops 2002 - 2004:

### 1st LAMNET Project Workshop, 19th June 2002, Amsterdam, The Netherlands

The first LAMNET project workshop was organised on the occasion of the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection. Key topics of the workshop included prerequisites for the implementation of future successful CDM projects and the impact of the Kyoto Protocol in Latin America and other emerging economies.

### 2nd LAMNET Project Workshop, 19th – 21st August 2002, Durban, South Africa

This workshop was organised on the occasion of the World Summit on Sustainable Development (WSSD) in Johannesburg as a joint event of the Thematic Networks LAMNET, CARENSA and SPARKNET funded by the European Commission, DG Research. The objectives of this workshop included energy generation from sugar cane bagasse, advanced pelleting technologies as well as small-scale bioenergy technologies for household applications.

### 3rd LAMNET Project Workshop, 2nd – 4th December 2002, Brasilia, Brazil

This workshop was organised in collaboration with the Brazilian National Reference Centre on Biomass (CENBIO) and focussed on strategies and policies as well as ethanol based fuel cell technologies and sustainable electricity generation opportunities in Latin America.

### 4th LAMNET Project Workshop - International Bioenergy Forum: China - EU Cooperation, 28th – 30th September 2003, Guangzhou, China (initially scheduled for April 2003)

This Forum for International Cooperation, co-organised by the European Biomass Industry Association (EUBIA), discussed cooperative efforts in the field of bioenergy between China, the EU and other supporting countries. The workshop objectives included the preparation of future bioenergy projects such as the large-scale integration of bioenergy within crude-oil refinery plants.

### 5th LAMNET Project Workshop - International Seminar on Bioenergy and Sustainable Rural Development, 26th – 28th June 2003, Morelia, Mexico

International Seminar on Bioenergy & Sustainable Rural Development

The objective of this seminar was to promote and increase the knowledge of the Bioenergy potential in Mexico and in the world as motor for sustainable rural development, agricultural and forestry diversification and the improvement of national and international environmental quality. A major outcome from the seminar was the creation of the Mexican Network on Bioenergy that will provide a forum to catalyse projects, information exchange and activities in the field of bioenergy.

### 6th LAMNET Project Workshop - The International Conference on Bioenergy Utilisation and Environment Protection, 24th – 26th September 2003, Dalian, China

The main objective of this conference was to promote international cooperation and knowledge exchange in the field of bioenergy technology as well as to promote the development of commercial biomass energy utilization in China in order to guarantee environmental protection and sustainable rural development.

### 7th LAMNET Project Workshop - International Conference on Bioenergy and Liquid Biofuel Development and Utilization, 20th – 23rd April 2004, Beijing, China

The aim of this conference was to promote international cooperation and knowledge exchange between actors from China, Europe, Africa and Latin America in the field of liquid biofuels and other bioenergy technologies. This biofuels conference included a technical tour to the world's largest bio-ethanol prodcution facility implemented by Jilin Fuel Ethanol Co. Ltd. in Jilin City on 23rd April 2004.

### 8th LAMNET Project Workshop, 9th May 2004, Rome, Italy

This workshop was organised on occasion of the 2nd World Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection, 10th – 14th May 2004, Rome, Italy. The main focus of the workshop was on bioenergy for rural income generation and sustainable development.

### 9th LAMNET Project Workshop - International Workshop on Bioenergy Policies, Technologies and Financing, 13th – 17th September 2004, Ribeirão Preto, Brazil

This workshop was organised on the occasion of and included a visit to the International Sugar and Alcohol Industrial Fair (FENASUCRO), one of the largest technological events in the sugar and ethanol sector worldwide. A technical tour was organised to a Biomass based Cogeneration Plant in the State of São Paulo providing information on the production of sugar, alcohol and bagasse derived electricity. Key topics of the workshop included liquid biofuels, Flex Fuel Vehicles, and international cooperation in the field of bio-diesel.

### 10th LAMNET Project Workshop – Biomass Opportunities in Venezuela, 22nd October 2004, Caracas, Venezuela

The objective of this workshop was to promote the use of biomass process technology applications in the industrial and agricultural sector of Venezuela. This workshop constituted the first bioenergy event in Venezuela and aimed at supporting the development of bioenergy in Venezuela through an involvement of a large variety of local and national stakeholders.

### 11th LAMNET Project Workshop - Biomass for a Strategic Energy Supply in China, 3rd November 2004, Beijing, China

This workshop discussed cooperative efforts in the field of bioenergy between Chinese and European biomass experts. The workshop continued the effort to promote schemes for bioenergy strategies and implementations in China.

On 4th, 5th and 6th November 2004, LAMNET activities and results have been disseminated to the Seminar on the occasion of the opening of the EU-China Energy and Environment Programme, the EU-China biofuels workshop, both in Beijing, and to the Forum on Renewable Energy in China at the Shanghai International Industry Fair 2004.

### 12th LAMNET Project Workshop – International Workshop for a Sustainable Development, 8th – 10th November 2004, Viña del Mar, Chile

The aim of this international workshop was to promote and improve the knowledge of bioenergy in Chile as a key tool for sustainable development, the development of clean technologies and the improvement of the quality of the environment. Additionally, this event provided a forum to discuss policies and regulations related to the use and development of alternative sources of energy in Chile. Follow-up activities to this workshop included the creation of a national Network on Renewable Energies in Chile.

## LAMNET Follow-up Activities:

### Demonstration of Bioethanol Hybrid Electric Vehicle Fleet in São Paulo

LAMNET partners from Brazil and Europe have joined a consortium formed by the City of Stockholm for the elaboration of a FP6 Integrated Project (IP) concept aiming at an accelerated development of bioethanol for sustainable transport in Europe.

Almost 9,000 vehicles and more than 150 fuelling stations are expected as a result of the project, making this the largest demonstration of alternative fuelled vehicles yet supported by the Commission. The project will validate the already excellent reliability, energy-effectiveness, environmental and societal benefits of ethanol used as a fuel and further improve the benefits through innovative ways of production, distribution and use in vehicles.

The LAMNET contribution to this IP concept will be the demonstration of a Bioethanol Hybrid Electric Vehicle (HEV) Fleet in the city of São Paulo. The innovative HEV technology combines regular combustion units with electrical engines in order to gain significant fuel savings and emissions reductions. The test fleet will be monitored by continuous emission measurements and efficiency tests. Additionally, the Brazilian LAMNET partners will provide their frontrunner experience on bioethanol production, distribution and utilization as well as in the field of Flex Fuel Vehicle (FVV) fleets in order to stimulate and support the introduction of bioethanol as sustainable transport fuel in Europe.

### Demonstration of Innovative Combined Bioethanol and BtL-Diesel Production

Within the framework of the European Commission's FP6 priority 'Sustainable Energy Systems' partners of the LAMNET consortium from China and Europe have elaborated a project concept for innovative biofuels production in cooperation with Choren Industries (Germany) and the Chinese Institute of Coal Chemistry (ICC). The objective of this project is to demonstrate the technical and economic feasibility of a unique combined production of bioethanol and BtL (Biomass-to-Liquid) Diesel using biomass, i.e. sweet sorghum, as a feedstock.

### Federal Agency of Science and Innovations of the Russian Federation and EUBIA, the European Biomass Industry Association, develop mutual co-operation

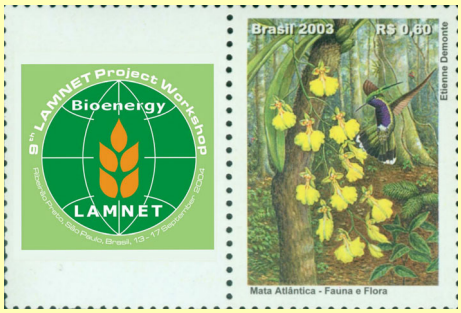
In November 2004, a Framework Agreement between the Federal Agency of Science and Innovations of the Russian Federation and EUBIA, the European Biomass Industry Association, has been signed. The Framework Agreement will be endorsed to the final Agreement on 13th January 2005, signed by Mr. S. Mazurenko from the Federal Agency of Science and Innovations of the Russian Federation, and Dr. Giuliano Grassi, General Secretary of EUBIA.

The Framework Agreement will facilitate the implementation and widening of scientific, technical and industrial cooperation for the promotion of energy efficient technologies, bioenergy conversion systems and applications on the base of equality and mutual benefits. The enhancement of information exchange and the facilitation of networking activities in sciences, engineering and business will include technological transfer, economic co-operation as well as joint workshops, conferences and publications.

A permanent Working Committee will be established for the implementation of the agreement and the development of strategies and specific cooperation programmes.

### Biofuel Cooperation between São Paulo and Bavaria

In October 2004 several Ministries of the State Governments of São Paulo (Brazil) and Bavaria (Germany) signed a Renewable Energy Technical Cooperation Agreement. One of the cornerstones of this agreement will be the joint implementation of RE demonstration projects in Brazil. In the field of liquid biofuels (biodiesel) production and utilisation LAMNET offered support to the involved Ministries for the elaboration and implementation of project concepts.




Stamp issued on the occasion of the 9th LAMNET project workshop

This Newsletter is intended to provide information on the LAMNET activities. Please visit our Website for the latest news on the LAMNET project:

**www.bioenergy-lamnet.org**

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**The Thematic Network on Bioenergy has been established to pave the way for the widespread deployment of bioenergy technologies.**

**Those interested in bioenergy contacts and willing to join our common bioenergy visions and realisations, should please send us an e-mail to one of above e-mail addresses.**

**Welcome to the Global Network on Bioenergy.**

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