Latin America Thematic Network on Bioenergy - LAMNET

8th LAMNET Project Workshop

International Workshop on Bioenergy for Rural Income Generation and Sustainable Development

Rome, Italy, 9 May 2004

Workshop Venue: Palazzo dei Congressi
Piazzale J.F. Kennedy, Rome, Italy

WORKSHOP SUMMARY

Introduction

The International Workshop on Bioenergy for Rural Income Generation and Sustainable Development took place in Rome, Italy on 9th May 2004. This LAMNET project workshop was organised on the occasion of the 2nd World Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection, 10th – 14th May 2004, Rome, Italy.

The workshop was attended by participants from the academic, non-governmental, official, social, and private sector. The workshop included a variety of scientific contributions that focused on bioenergy for rural income generation and sustainable development. All presentations are available at the LAMNET Project Website http://www.bioenergy-lamnet.org.

Sunday 9th May

Session 1: Bioenergy for Rural Income Generation and Sustainable Development

Welcome Address – Progress and Results of the LAMNET Global Bioenergy Network

The Welcome Address by Dr. Rainer Janssen, LAMNET project co-ordinator, included a brief report on the structure and activities of the project 'Latin America Thematic Network on Bioenergy (LAMNET). LAMNET is a network of 48 institutions from 24 countries worldwide and provides a transnational forum for the promotion of sustainable biomass utilization. The network is funded by the European Commission within the programme 'Confirming the International Role of Community Research' and is coordinated by WIP, Germany in partnership with ETA, Italy and the European Biomass Industry Association, EUBIA. Furthermore, the Latin American organizations CENBIO, Brazil and UNAM, Mexico act as coordination support points.

The main objectives of the Global Bioenergy Network are:

- to address the adequate utilisation of ***biomass residues and energy crops***
- to make use of selected ***reliable and proven practical technologies and systems***
- to arrive at ***local, regional, national and international solutions*** for bioenergy applications
- to contribute to ***poverty alleviation and sustainable development***
- to ***develop and implement policies*** for the enhanced utilisation of biomass and bioenergy

Within the project, recommendations are elaborated for the development and implementation of policy options. The efficient dissemination of the project results is realised through the project web site (www.bioenergy-lamnet.org) and the publication of a periodical newsletter and several leaflets. Furthermore, several workshops and seminars focussing on bioenergy related topics are organised during the entire period of the LAMNET project.

Lessons Learnt from Bioenergy Pogramme Implementation in Brazil

Prof. José Roberto Moreira from the Brazilian National Reference Center on Biomass (CENBIO) outlined the Brazilian Alternative Energy Sources Incentive Programme (Programa de Incentivo às Fontes Alternativas de Energia Elétrica - PROINFA). The objective of PROINFA is to increase the share of Brazil's electricity generation capacity represented by wind, small-scale hydro, and biomass. The long-term goal of PROINFA is to increase the contribution of renewable energy to 10 percent of the annual electricity consumption within the next 20 years. Therefore, the Government of Brazil has obligated the federal state-owned power utility Eletrobras (Centrais Elétricas Brasileiras S.A.) to purchase the electric energy by signing long-term power purchase agreements (PPAs) with renewable energy facilities.

In the first phase, the Brazilian energy utility Eletrobras is to sign 15-year contracts for the implementation of 3,300 MW of renewable energy sources, introducing to the national energy matrix 1,100 MW of wind energy (2.89 TWh/year), 1,100 MW of Small Hydro Plants (SHPs) (5.78 TWh/year) and 1,100 MW of Bioenergy Plants (6.75 TWh/year). Within the second phase, 6,518 MW of wind energy (17.13 TWh/year), 6,518 MW of SHPs (34.26 TWh/year) and 6,518 MW of Bioenergy Plants (39.97 TWh/year) will be implemented. The contracted projects are scheduled to begin operation by December 30, 2006. The power purchase agreements will cover each of the above mentioned renewable energy sources. The price is going to be adjusted to the specific economic value and will account for at least 80 percent of the average energy supply tariff charged from end-consumers in Brazil.

The second phase of PROINFA will start immediately after the initial target of 3,300 MW is achieved (foreseen in 2006) and should increase the contribution of renewable energy by 15 percent annually, until it reaches 10 percent of the total electric energy consumption. The PPAs will have a validity of 15 years and the purchase price, will correspond to the economic value. This price is to be defined as the weighted average cost of electricity, generated by hydropower plants with a capacity of more than 30 MW, and natural gas fuelled power plants.

Flexfuel vehicle technology is entering the Brazilian market

At the end of his presentation, Prof. Moreira outlined the future perspectives of Flexfuel Vehicles in Brazil. Since 2003, when the first Flexfuel Vehicles were introduced to the Brazilian market, this new transport technology is spreading throughout the Brazilian automobile industry. It is the dual fuel engine, powered with gasoline and/or alcohol, giving the consumer total liberty in choosing one of the fuels, or mixing them in any proportion. By today the manufacturers Volkswagen, Ford, Fiat and GM have introduced 19 car models on the Brazilian market. It is expected that around 600.000 or 30% of the car sales in Brazil during 2004 will be Flexfuel cars. By the end of 2007 even 67% of the overall car sales are believed to be equipped with the Flexfuel technology.

Bioenergy in FAO – Focus on Development and Environment

Gustavo Best from the UN Food and Agriculture Organization (FAO) presented the status and importance of bioenergy in FAO focusing on development and environment. Main objectives are to enhance rural development and food security, to integrate bioenergy to forestry and agricultural sectors, and to support and promote the sustainable management of biomass resources, conversion technologies and utilization schemes.

The development of tools and methodologies for rapid field assessment of available biomass potential, as well as the integration of bioenergy issues to energy policies and the stimulation of the R&D sector are most important issues that need to be addressed in order to promote the bioenergy sector. The enhancement of food security and rural development goes along with the stimulation of the twofold role of agriculture as an energy producer and food supplier.

Bioenergy from agriculture can bring benefits for the society, the environment and the economy. The society will benefit from new employment opportunities and a higher quality of life, enhanced education and health. The implementation of bioenergy will contribute to global environment and carbon substitution within the Kyoto Protocol. Furthermore, bioenergy opens up new chances for cleaner and more sustainable technologies for the transport and industry sector. However, the constraints of land use conflicts, environmental impacts of large monoculture plantations, low energy conversion rates and high technology costs are barriers that need to be removed. The FAO therefore focuses on an International Bioenergy Information System and permanently supports a variety of bioenergy programmes.

Farmers as Energy Producers

New income opportunities for farmers as energy producers were presented by Dr. Heinz Kopetz, Vice-President of the European Biomass Association (AEBIOM). Dr. Kopetz emphasised that 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. There are two possible strategies for future development:

Bioenergy production and final energy services

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. The set up of heating plants, biogas plants or wood gasification systems is needed 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.

Production of energy raw materials

This 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.

Small-scale Bioenergy Technologies for Rural Applications

Dr. Omar Masera from the National Autonomous University of México (UNAM) presented rural sector applications for small-scale bioenergy technologies. He presented details and outcomes of a project that aims at the improvement of rural communities through sustainable fuelwood use in México.

The project disseminated 1,500 efficient fuelwood cooking stoves in 30 villages and included 30 independent stove builders and 3 regional suppliers of stove parts. The aim was to develop a model for stove dissemination that is replicable in other countries. The newly developed 'Patsari Stove' has an optimized design of the combustion chamber that helps to reduce fuel wood consumption by 60-80 percent. The cost of the durable stove is 30 US$ in total, where 16 US$ are material costs and 14 US$ are setup costs. The project included training activities for stove construction and maintenance, as well as economical cooking techniques. Furthermore, financial incentives and market creation activities helped to promote the improved cooking stove technology.

The newly developed 'Patsari Stove'

Bioenergy Technologies for Industrial Applications

Mr. Denis Tomlinson from Illovo Sugar Ltd., South Africa outlined the Renewable Energy Strategy employed by the Republic of South Africa. This strategy runs along the 3 lines of 'independent industry action', the 'co-operation with the National Electricity Regulator (NER) and the main national energy provider ESKOM' and 'green energy independent power producers'. Especially within the sugar cane industry there is a great potential for an increased generation of green energy, either for the industry's own energy consumption or for feeding into the grid. This potential may be exploited through the use of innovative technologies such as high pressure boilers, biomass integrated gasification combined cycle (BIGCC) systems as well as pelletisation and ethanol production units.

Session 2: Examples of Worldwide Biomass and Bioenergy Utilisation – Part 1

Fuel Cells for Biofuel Based Electricity Production

Mr. Peter Berger of MTU CFC Solutions GmbH, Germany, presented innovative fuel cell technologies for the electricity production using biofuels as feedstock. MTU CFC Solutions GmbH is the subsidiary of MTU Friedrichshafen that develops and manufactures stationary fuel cells for generating power and heat. The MTU HotModule is a high-temperature fuel cell power generation plant for stationary use with outstanding compactness and efficiency. The technical concept of the MTU HotModule sets an ecological example regarding pollutant-free exhaust air, extremely quiet operation and utilization of various regenerative energy resources (e.g. biogas, residual gas, landfill gas, sewage gas). The high efficiency of approximately 50 percent at atmospheric pressure, as well as high temperatures providing extensive usable heat are the main advantages of the MTU HotModule concept.

MTU HotModule installed at an office building in Munich

Industrial Fibres Production from Sugarcane Bagasse

The industrial production of fibres from sugarcane bagasse in Brazil was presented by Dr. Markus Real from Bagasse Biorefining AG. During the last decades, there has been a growing interest in natural fibres. The established partnership between Bagasse Biorefining and Edra Ecosystema in Brazil included initial tests in Switzerland and from 2003 on in Brazil. In March 2004, the first industrial plant has been built in Ipéuna, Brazil. The plant produces 2,000 tons of dry fibre per day and includes a quality assurance system. Until the end of 2004, the production will be ramped up. Research and development on fibre and final products will be increased in order to qualify as a reliable fibre supplier for the industry. In the future, potential partnerships for technology applications outside Brazil will be identified.

Bioenergy Opportunities for Venezuela

Dr. Evanan Romero from the Fundacion Momento de la Gente, Venezuela, presented opportunities for biomass applications in Venezuela. The country has ideal prerequisites to replicate experiences regarding bioenergy utilisation, such as the bioethanol program implemented in Colombia. However, the available biomass resources currently cannot compete with prices of fossil energy resources. Therefore, governmental subsidies to fossil fuels need for be pared down. The Fundacion Momento de la Gente promotes the utilization of bioenergy and it is most likely that the Venezuelan government will support this objective, since it corresponds with the envisioned guidelines to reduce the consumption of fossil fuels in Venezuela.

Life Cycle Analysis of Bioethanol Production and Use

The CO_2 life cycle analysis of ethanol production and use in Brazil was presented by Dr. Manoel Regis Leal from Copersucar, Brazil. Dr. Leal stressed that sugar cane has a considerable energy content, but only about one third of the potential is converted into useful renewable energy under today's practices. Nevertheless, even with the inefficient technology used today to produce ethanol from cane the energy balance is highly favorable when the renewable energy output is compared with fossil energy input.

Three energy levels are considered in the analysis:

- Level 1: Fuel and electric energy directly used in the production process (agricultural and industrial).
- Level 2: Energy used in the production of chemicals, lubricants, fertilizers.
- Level 3: Energy required for the fabrication, erection and maintenance of equipment, structures and buildings.

As a result, the energy life cycle analysis for sugar cane production and its processing to sugar and ethanol indicates an output of renewable energy that is more than nine times larger, compared to the fossil energy input. This results qualifies ethanol to be an important opportunity to reduce CO_2 emissions.

Furthermore, the existing technology of high pressure boilers combined with efficient steam turbines and the displacement of natural gas fired power plants can lead to an enormous CO_2 reduction.

Session 3: Examples of Worldwide Biomass and Bioenergy Utilisation – Part 2

New Bioenergy Information Systems

Dr. Jeremy Woods from the Imperial College London presented an outline of a new bioenergy information system. He emphasized the high complexity of biomass energy and the importance of innovation and technology transfer activities as drivers for bioenergy development. Furthermore, Dr. Woods presented necessary prerequisites for successful bioenergy information systems. The identification of relevant clients is most important, as they vary at each stage of the overall bioenergy provision chain. The information system needs to cover the following categories:

- Examples of practical information
- Methodologies for resource assessment
- Appropriate scale and technologies
- Successful policy making frameworks
- Geographic scale matters
- Flexibility to allow site-specific heterogeneity

In conclusion, Dr. Woods highlighted the potential of bioenergy for energy security, rural development, climate change mitigation and energy decentralization. Sufficient information, collaboration and innovation are the key drivers for bioenergy to play an outstanding role within the future energy supply.

FAO´s Approach to Wood Energy

A modern approach to wood energy at FAO was presented by Dr. Miguel Angel Trossero from the Food and Agriculture Organization (FAO). The mission of the FAO's Forestry Department is to enhance human well-being through the sustainable management of the world's trees and forests while increasing the capabilities of forestry services within the promotion of sustainable wood energy systems. The new challenge is to strengthen, expand and diversify the current role of the forestry sector. However, the promotion of wood fuel as an industrial energy option goes along with barriers and constraints. The inexistent policies and legal regulations, as well as the low public and political awareness are the main barriers to the utilization of wood energy. The FAO's approach therefore includes the following measures:

- Raise the political and public awareness
- Assist the legislation process and promote incentives
- Develop inter-institutional programmes
- Strengthen national and international partnerships
- Improve information, dissemination and training activities
- Update and upgrade the existing education programmes

Biomass Resources for Synthetic Fuels

Prof. Nasir El Bassam from the International Research Center for Renewable Energy in Germany presented the opportunities of biomass resources for the production of innovative synthetic fuels. In many countries, vegetable oils, biodiesel, biogas and bioethanol have already been successfully introduced. The good characteristics regarding storage, transport, conversion and the positive energy balance of biomass represents the largest and most sustainable alternative to substitute fossil fuels within the future energy matrix.

Oilfields of the 21st century

Future alternative fuels must offer the possibility to directly substitute fossil fuels within the already existing infrastructure. New technologies for combustion systems and energy generation (i.e. fuel cells) need to be developed in order to deliver affordable, reliable, sustainable and renewable energy for the future.

Biomass Energy for Rural Development

Mr. Mamadou Dianka from the Regional Programme for the Traditional Energy Sector (RPTES) of the World Bank presented the Biomass Energy Project for Rural Development in Senegal (PROGEDE). The project includes the following operational components:

- Preparatory and Support activities
- Sustainable Wood Fuels Supply Management
- Demand Management and Fuel Substitution

PROGEDE nergy shop for farmer education

The project approach included the multi-sectional focus and the “assets-based” rural development with a market-based private sector participation. The outcomes are enhanced biomass energy supply security as well as environmental and socio-economic sustainability within the mitigation of climate change.

The following results have already been achieved in the framework of the PROGEDE project:

- Sustainable production of fuel wood reached 290,000 tons per year
- Sustainable forest management system was implemented in 191 villages
- Net CO_2 emission reductions of the project reached 988,600 tons
- Income of rural communities from forestry and agriculture amounted to 7.7 million US$

LAMNET Project Coordination

WIP
Sylvensteinstr. 2
81369 Munich
Germany
Coordinator: **Dr. Rainer Janssen**
Phone: +49 89 720 12 743
Fax: +49 89 720 12 791
E-mail: rainer.janssen@wip-munich.de
Web: www.wip-munich.de

LAMNET Coordination Partner

ETA – Energia Trasporti Agricoltura
Piazza Savonarola, 10
50132 Florence
Italy
Contact: **Ms. Angela Grassi**
Phone: +39 055 500 2174
Fax: +39 055 573 425
E-mail: angela.grassi@etaflorence.it
Web: www.etaflorence.it

LAMNET Coordination Partner

EUBIA – European Biomass Industry Association
Rond Point Schuman, 6
1040 Brussels
Belgium
Contact: **Dr. Giuliano Grassi**
Phone: +32 2 28 28 420
Fax: +32 2 28 28 424
E-mail: eubia@eubia.org
Web: www.eubia.org

LAMNET Coordination Support Point South America

CENBIO – Centro National de Referência em Biomassa
Avenida Prof. Luciano Gualberto 1289
05508-900 São Paulo
Brazil
Contact: **Prof. Dr. José Roberto Moreira**
Phone: +55 115 531 1844
Fax: +55 115 535 3077
E-mail: Bun2@tsp.com.br
Web: www.cenbio.org.br

LAMNET Coordination Support Point Central America

Universidad Nacional Autónoma de México
Instituto de Ecología
AP 27-3 Xangari
58089 Morelia, Michoacán, México
Contact: **Dr. Omar Masera**
Phone: +52 55 5623 2709
Fax: +52 55 5623 2719
E-mail: omasera@oikos.unam.mx
Web: www.oikos.unam.mx

Steering Committee

Contact: **Dr. Peter Helm**
E-mail: peter.helm@wip-munich.de

This Thematic Network is funded by the European Commission, DG Research, (Project No. ICA4-CT-2001-10106).