Latin America Thematic Network on Bioenergy - LAMNET

Joint Workshop - South Africa

Timing: 19th August 2002 – 21st August 2002

Location: Kwa-Shukela Convention Centre
170 Flanders Drive, Mount Edgecombe (Durban)
P O Box 804 Westville 3630
Republic of South Africa

WORKSHOP PROCEEDINGS

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This workshop was organised by WIP-Munich, Germany and Illovo Sugar Ltd., South Africa, within the framework of the LAMNET project as a joint event of the following Thematic Networks funded by the European Commission, DG Research:

CARENSA - Cane Resources Network for Southern Africa
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SPARKNET – Sustainable Energy Policy and Research 'Knowledge Network' on cost effective, ecologically sound and healthy energy alternatives for low-income rural households
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MONDAY 19th AUGUST 2002 (Proc. Part 1)

Inauguration Session

Moderators: Denis Tomlinson, Illovo Sugar and Rainer Janssen, WIP

Afternoon Session: Biomass, Rural Energy and the Environment

Moderator: Gerry Garland, University of Natal

TUESDAY 20th AUGUST 2002 (Proc. Part 1)

Morning Session: Bioenergy from Sugar Cane Bagasse

Moderator: Peter Grimm, WIP

Afternoon Session: Rural Energy – Woodfuels, Charcoal and Household Issues

Moderator: Smail Khennas, ITDG

WEDNESDAY 21st AUGUST 2002 (Proc. Part 2)

Technical Tour: 08:00 – 18:00

Technical Tour to Gledhow Sugar Mill and Glendale Distillery operated by the company Illovo Sugar Ltd., member of the LAMNET Thematic Network.

Programme of the Technical Tour:

08:00 Departure at Zimbali Lodge, Transfer to Gledhow Sugar Mill

08:45 Coffee/Tea break at Gledhow Sugar Mill

09:00 Introduction to Gledhow Sugar Mill by Mr. S. Rau, General Manager of Gledhow Sugar Mill

09:30 Field Visit: Harvesting and Collection of Sugar Cane

10:30 Factory Visit: Preparation and Extraction methods

12:00 Discussion Round on Field and Factory Visit

12:30 Lunch with selected Gledhow managers to discuss further issues

13:30 Brief visit to SAPPI Paper Mill (optional)

14:30 Tour to Glendale Distillery (20 minutes transfer from Gledhow)

16:00 Return to Gledhow Sugar Mill, Discussion Round

17:00 Transfer to Zimbali Lodge or Kwa-Shukela Convention Centre

17:30 Arrival at Zimbali Lodge

Contact Person:
Mr. Denis Tomlinson (dTomlinson@illovo.co.za)
Illovo Sugar Ltd, Republic of South Africa

Figure: Gledhow Sugar Mill

MONDAY 19th AUGUST 2002 – Inauguration Session

Joint Workshop by CARENSA – SPARKNET – LAMNET

Welcome Address

Don Macleod
Managing Director
Illovo Sugar Ltd.
Illovo Sugar Park, 1 Montgomery Drive
4300 Mount Edgecombe
South Africa
Internet: www.illovosugar.com

Honourable ministers, Mr. Narend Singh and Dr. Adi Paterson, distinguished guests, presenters and LAMNET members, welcome to the biotechnology workshop in South Africa.

It is an honour to have so many experts in the field of energy with us at KwaShukela which is the headquarters of the South African sugar industry.

This workshop constitutes a platform for delegates to discuss topics for the development and implementation of sustainable energy options in Southern Africa and other emerging countries.

Sugar cane has a proven record as a rural development crop within Southern Africa. However, sugar producers in many parts of the developing world are exposed to the world market sugar price, which is very volatile and often below the costs of production of even the most efficient producers. The sugar cane plant is basically made up of sucrose, fibre (bagasse), non-sucrose (molasses) and water. The production of energy from both bagasse and molasses is a known technology and therefore sugar by-products can contribute to the global movement towards sustainable ”green energy” whilst also improving the return to producers of sugar.

Illovo is the largest sugar cane (5.5 million tons) and sugar producer (2.2 million tons) in Africa and has been in existence for over 100 years. The company is listed on the JSE Stock Exchange in South Africa and has sugar cane operations in South Africa, Malawi, Swaziland, Zambia, Mozambique and Tanzania as well as a beet factory in the United States. The company produces a variety of downstream products such as furfural, furfuryl alcohol, diacetyl, acetoin, 2.3-Pentanedione and ethyl alcohol. The production of Crop Guard, using furfural as the principal source material, commenced last year. Registration for its use as an agricultural application for the control of nematode infection of groundnuts and tomatoes has been approved by the South African Department of Agriculture. The registration programme for extending its use to other crops, other applications (e.g. fungicide) and to other countries is in progress. This shows we are a company that continues to search for ways to add value to a stick of cane.

The company utilises bagasse for the generation of electricity for its factory and field operations as well as supplying power to the company housing estates. Currently, the supply of excess power during the season into the grid is not encouraged by the national energy suppliers. In addition during the offcrop, which is between 12 and 20 weeks, the ability to supply our own needs, and those of others, is restricted by the supply of raw materials at an economic price. The supply of power to both our operations and into the national grid was undertaken by the company when it was involved in the Mauritian sugar industry. In addition, the company has two molasses distilleries in South Africa, one of which used to supply fuel alcohol to the motor industry.

The new technologies which are being developed as a result of the desire to develop green energy, by people such as the delegates present, give potential to companies like Illovo to improve their energy generation, not only for their own use, but also to enable them to export the power surplus to the national grid. The pelleting technology for a variety of biomass feedstocks will be an important step in providing energy from bagasse on year-round basis and the papers on this subject will be of specific interest to our group. In addition, the provision of alcohol as part of the coutry´s gasoline policy is an opportunity for growth in the production of fuel alcohol. However, the economic viability of green energy is dependant upon the interventions of national governments to assist in this occurring, other than for use in our own factory and agricultural operations.

Green energy in the form of alcohol and combustible gases produced from a renewable resource such as sugar cane should be considered as an option for meeting the increasing energy needs of the world. Brazil is certainly at the forefront of the provision of energy from alcohol but it is interesting that there is increasing interest by two other major sugar producers, Australia and Thailand, in developing a large amount of alcohol for the gasoline industry.

In closing I wish all participants an interesting few days of discussing the development of sustainable, environmentally-friendly products. Biomass energy from sugar cane could not only provide sustainable energy but also result in increased rural development through increasing opportunities for sugar cane production, but it must be economically viable and not just an academic exercise.

Thank you

Joint Workshop by CARENSA – SPARKNET – LAMNET

Inauguration Address

Honourable Narend Singh
Minister for Agriculture and Environmental Affairs
Province of KwaZulu-Natal
South Africa

Mr. Don MacLeod, Managing Director of Illovo Sugar; Dr. Rainer Janssen, of WIP-Munich; Miss Angela Grassi, of ETA-Florence; Dr. Paterson, Deputy-Director-General of the national Department of Art, Culture, Science and Technology; delegates; other honoured guests; ladies and gentlemen,

I WELCOME all of you to this three-day Workshop, and it is my particular pleasure to welcome to the province of KwaZulu-Natal those of you who are from overseas, from elsewhere in Africa or from other parts of South Africa itself. It is a privilege to be able to speak in the company of such a distinguished gathering of scientists and technologists who are very much at the cutting edge of efforts to bring sustainability to our world in the 21st century, especially in the area of agriculture-related industry. I feel equally honoured that KwaZulu-Natal should have been chosen as the place in which dialogue should be initiated between three world networks which concern themselves with bio-energy. These are: SPARK-NET – Sustainable Energy Policy and Research Knowledge Network, based in the United Kingdom; LAMNET – the Latin America Thematic Network on Bio-energy; and CARENSA – the Cane Resources Network for Southern Africa. I am sure this Workshop will produce synergies to greatly advance our understanding of the concept of Green Energy – the use of biomass to produce electricity and other energy forms on a sustainable and economically viable basis – as well as the practicalities of putting the concept into effect.

The Workshop is, of course, part of a great funnelling of input to the United Nations World Summit on Sustainable Development, which starts in Johannesburg next week and is intended to chart a course over the next decade to turn the world away from a self-destructive course, which began in the 19th century, in which the economic and other activities of humankind threaten to so deplete the natural resources of the planet that human existence could be severely blighted, if not eventually ended altogether. I understand the aim of your dialogue is to prepare an elaborated document for presentation to the Earth Summit, and I wish you every success in that. I am told that an organisation known as Agama Energy – a "green" electricity company – will supply power to the Ubuntu Village and the Expo Centre in Johannesburg during the Summit. I understand the source of this Green Electricity is likely to be wind power, but Agama operates within the same philosophical area as yourselves, concerned to maintain the benefits and comforts of modern technology, but greatly reducing our reliance on the burning of fossil fuels to produce energy. The Green Electricity in Johannesburg this week will, of course, be mainly symbolic. It is doubtful whether Agama can produce it at short notice cheaper than supplied by the conventional electricity grid, which is based on fossil fuels and nuclear energy. However, I hope the document which emerges from this Workshop will produce something more than just symbolism in terms of Green Energy from biomass. I hope it will suggest some practicalities as well.

Sustainable Development

Ladies and gentlemen, I would like to briefly set out how I see the overall challenge of sustainable development. It seems to me we have two extremes in the world configuration. One is what happens in the developed world where industrialisation and the burning of fossil fuels pose all kinds of deadly dangers of pollution which, if not properly addressed, pose short-term health risks as well as long-term risks such as global warming. This could also lead to wide-scale desertification and a rise in ocean levels as the polar ice caps melt, flooding low-lying land regions and possibly even causing certain inhabited island groups to disappear altogether. The storms and devastating flooding we have seen in Europe in recent weeks, as well as in parts of Asia, could well be a manifestation of this threat. It is scientifically unproven, and one does not wish to be alarmist, but these floods do at least illustrate the consequences if global warming is a fact and the process is not reversed.

At the same time, fossil fuels are finite and alternatives to them will eventually have to be found. The developed world poses the threat of over-consumption. The developed nations have achieved standards of material comfort never known before in the world's history. Some would describe such comfort as unnecessary, if not obscene. Whatever, these living standards require the consumption of vast quantities of the planet's natural resources – oil, gas, timber, various metals – much of the supply coming from the under –developed world. Because the developed nations are so wealthy they are able to buy whatever is needed to maintain their immediate comfort, which means such things as rain forests being cut down for their timber and pristine wilderness areas being mined, to the detriment of the planetary ecology. This super-consumption – central heating in every home, motorways clogged with single-driver cars with smoking exhausts – could well be contributing significantly to global warming and other climatic changes.

Then we have the threat at the other extreme, in the under-developed world. Here one finds poverty-stricken communities who, in the daily struggle for sheer survival, will slash and burn, not just in the vast equatorial rain forests but often much closer to home as well. Dukuduku, near Lake St. Lucia, not all that far north of us, is a case in point where desperate people destroy forests which are thousands of years old so they can work a patch of ground for a season or two until its fertility is exhausted, and they then move on. Such people are driven by desperation, by hunger ladies and gentlemen, and I am not condemning them, merely pointing out what a threat to sustainability such conditions of rural poverty pose. And it is not just at Dukuduku. All over South Africa – and in fact all over the developing world – poverty-stricken communities are exhausting the soil, burning off grassland, destroying woodlands and destroying the natural sponges which hold our water resources because the immediate alternative is death by starvation. You cannot argue the benefits of sustainability with a man whose family will die if they are not fed right away.

South Africa unique

Ladies and gentlemen, both these extremes exist in South Africa. We are unique in having a developed industrial economy, with all its challenges of sustainability, virtually cheek by jowl with an under–developed rural economy with all the evils of erosion, contamination of water resources, destruction of natural foliage, over-stocking and exhaustion of the soil's fertility through unscientific cropping. We are in many ways a microcosm of the challenges to be addressed by the WSSD. I find it a little alarming that a country South Africa's size apparently produces between four and five percent of the world's carbon emissions and ranks the 15th highest offender globally.

Multi-faced concept

I think it is important that we grasp from the start that sustainable development is a multi-faceted concept. It has strong elements of environmentalism and conservation. Development which degrades the environment or destroys bio-diversity is unacceptable and doomed anyway.

There is the economic dimension. Development which is not economically viable will collapse as soon as the artificial stimulus is removed, so there is no point in even starting it. And it has a social dimension as well. Successful development requires the buy-in of local communities, otherwise nothing will happen, and that buy-in is unlikely unless the development is geared to the community's social upliftment through economic improvement.

I believe everything is inter-linked, ladies and gentlemen. What is required is a balance between all three interests – environmental/conservation, economic and social – adjusted appropriately to suit every particular circumstance, and it is generally the role of Government to initiate and to serve as a catalyst and regulator, in partnership with the private sector wherever possible.

I think we need to always bear in mind the need for that balance. Sometimes there is a tendency, when looking at sustainable development, to focus on one issue – say environmentalism and conservation – to the exclusion of the others. And the inevitable result is that the development is in fact not sustainable after all.

Green Energy

Ladies and gentlemen, within the context I have outlined, I believe the subject matter of this Workshop directly addresses some of the major concerns of planetary sustainability. It addresses the concern that clean, Green Energy should become available on an economic and sustainable basis, in order to drive our modern technology – which would require a reduction in the use of fossil fuels – and it simultaneously addresses the

fact that those fossil fuels are going to run out anyway. Something will have to replace them if we are not to return eventually to the conditions of the 18th century. I believe both those concerns have to be borne in mind as we discuss sustainability. And a glance through the titles of the papers to be presented and discussed over the next three days suggests opportunities to be explored in using biomass – vegetable residues – to generate energy which is converted from heat into electricity, as well as in producing fuel alcohols which are considerably more environment-friendly in terms of emissions into the atmosphere and do not consume fossil fuel reserves.

Sugar and timber

Two industries in KwaZulu-Natal immediately suggest themselves as potential sources of Green Energy. The sugar industry – which is one of South Africa's success stories as a large, self-regulating agro-industry and is centred in this province – already uses its bagasse, which is the fibrous residue of the sugar extraction process, to fire boilers which generate steam to produce electricity for the operation of the sugar mills.

This is Green Electricity, ladies and gentlemen. Instead of taking electricity from a grid which is based on the burning of fossil fuels, with all the atmospheric pollution that entails, it comes from bagasse, which is to my mind an elegant closing of the loop in environmental terms and an economic use of what would otherwise be a problem in waste disposal.

I believe we need to seriously explore whether the sugar industry could not become a significant supplier of Green Electricity, feeding into the national grid or connecting to individual consumers. I believe we need to explore other sources of biomass also. The timber industry – also a gigantic success story with a large part of its operations in KwaZulu-Natal – produces veritable mountains of sawdust and tree bark for which it has no economic use. These too are biomass. I believe we should explore whether this source could not be economically fed into a Green Electricity operation.

Maize

Maize is another source of biomass in quantity. While most maize stalks are presently used as livestock fodder, who can tell what the future holds? My Department has embarked on a scientifically based programme to quadruple agricultural production in KwaZulu-Natal over the next 20 years. It could well turn out that production of maize (or other crops) outstrips livestock farming and that we will have left over significant maize or other biomass, available for conversion into Green Energy. I believe the potential Green Energy spin-off is something which we will have to take into account as we plan this programme of Unlocking Agricultural Potential.

Alcohol/fuels

Ladies and gentlemen, I turn now to the production of alcohol/fuels from biomass. Brazil and Cuba already produce an ethanol fuel from sugar cane. Thirty or so years ago we had a thriving ethanol operation here in KwaZulu-Natal. You could buy the product – known as Union Spirit – from the petrol pumps at a very competitive price. There were various strategic and economic reasons why South Africa moved away from ethanol, but I believe that – 30 years on – there would be no harm in re-examining the economics and the strategic considerations involving a resuscitation of such an operation, not least in view of the dollar price of crude oil imports.

Bio-dieseline

And, in the same context, my Department and various other interests in KwaZulu-Natal are seriously looking at the production of bio-dieseline. This can be produced from sunflower seeds and the noxious emissions which result are minuscule by comparison with conventional dieseline. However, sunflower oil is also a food source which means its price usually makes it uneconomical as a fuel. But we have growing in the wild in KwaZulu-Natal a plant which is the richest known source of bio-dieseline, and it is being seriously investigated as a source.

The plant – Jatropha – is an alien shrub from South America, which has established itself in the wild in the sub-tropical regions of eastern Africa, which means most of KwaZulu-Natal. A German company has expressed interest in setting up a bio-dieseline refinery somewhere in the province, and my Department is presently conducting trials at its research stations to discover which region would grow Jatrohpa most successfully. That would presumably determine where the refinery should be located.

I believe the bio-dieseline project not only holds out growing opportunities for small-scale and commercial farmers alike, it also presents itself as an exercise in Green Energy because of the very low noxious emissions from bio-dieseline and the fact that it reduces the burning of fossil fuels.

New thinking

Ladies and gentlemen, I have sketched what I see as some opportunities in the production of Green Energy, as a contribution to the targets which will no doubt be set at the Earth Summit to rescue our planet from widespread degradation. I have no doubt more will present themselves in the decade leading up to the next Summit. Required of us is an alertness to opportunity and a readiness to use innovative lateral thinking. What might have seemed ridiculous ten years ago could be the answer today.

I am told the demand in South Africa will exceed electricity generation capacity within three to five years, and decisions will have to be made about new generation. At the same time, I understand, a Draft White Paper on Renewable Energy and Clean Energy Development requires a five percent increase in the use of Green Electricity by 2012.

Thukela Basin

That is a formidable challenge. To meet it will require great ingenuity. I believe we need to take another look at the hydro-electric resources of the Thukela Basin – a natural feature of this province – which have been exhaustively studied since the 1940s and which are said to be sufficient to provide energy for a city the size of Greater London plus several more major cities.

Conclusion

And we need also to look at biomass as a source of Green Energy, as you will be doing over the next three days. As I said earlier, I believe you in this Workshop are at the technological cutting edge of discovering formulae for planetary sustainability. I believe we need to avoid being trapped in the thinking of the past. The environmental challenges which confront the world today have their origins in the coal-burning Industrial Revolution of the 19th century and in the oil-burning technologies of the 20th century. As Einstein said, problems can be successfully resolved only by thinking of a complexity higher than the thinking which produced the problems.

That is what we need. I believe the world requires a quantum leap in its thinking about sustainability, a paradigm shift. All kinds of people about the world are working toward that, including yourselves, drawn as you are from something like a dozen different countries. I wish you success in your deliberations over the next three days; I wish you a pleasant stay in KwaZulu-Natal; and I thank you for your attention.

Joint Workshop by CARENSA – SPARKNET – LAMNET

Inauguration Address: The New South African National R&D Strategy

Dr. Adi Paterson
Deputy Director-General
Department of Science and Technology
Ministry of Art-Culture-Science-Technology
South Africa

Ladies and Gentlemen it is a great honour to welcome you to the workshop on BioEnergy and a special welcome to our visitors to South Africa. The month of August marks a very exciting time in our country since we will be hosting the World Summit on Sustainable Development. The aims of the summit are also closely linked to your efforts in developing sustainable energy alternatives and it is expected that renewable fuels will be a subject of discussion at the World Summit on Sustainable Development.

The technicalities of energy policy are important, but more so are the social dimensions. The building of human resources is paramount to the effective utilisation of energy and the ensuing benefits. South Africa's priorities in the WSSD are strongly informed by the need to reduce poverty and provide a new paradigm for development. Energy is one of these paradigms and it is the life-blood of development.

South Africa is a country endowed with abundant energy resources and we have a relatively strong energy supply industry, to the extent that we export energy in the form of coal, electricity and liquid fuels to our neighbours and various countries across the world. Although coal's contribution to South Africa's total primary energy supply has declined slowly, it still dominates the energy sector. Approximately half the coal consumed in South Africa is used for the generation of electricity, and a quarter for the production of synthetic liquid fuels. Since the use of coal carries with it the potential for significant negative environmental impacts it is necessary that measures be put in place to ameliorate these impacts. Although coal has always made a significant portion of South African energy base there has been significant progress in alternative energy sources such as solar power, wind power, pumped storage and in hydro-power schemes.

With the end of apartheid South Africa experienced fundamental shifts resulting in significant changes in the energy policy context. The election of a new government necessitated a review of existing policy. Government's wish to integrate these and provide policy stability led to it formally launching the White Paper on the Energy Policy in December 1998. This White Paper therefore addresses the issues of an energy mix (inclusive of renewables) as well as environmental impact issues as an integral part of the energy policy.

After a period of exceptionally low price for imported crude oil, there was a significant increase during 2000, resulting in high prices for paraffin, petrol and diesel. From 1990 to 2000 the cost of crude oil imports rose from less than 3 % of the GDP to just over 4 %. More than 90 % of the increase was the result of the fall of the Rand against the US dollar. The problem of the country's future exposure to the international price of crude oil could worsen if the exchange rate continues to fall. This has caused economic and social hardship and put pressure on the Government to consider alternative energy sources. The present outlook for future oil prices is uncertain but it is recognised that the prospect of oil prices to fall to the low levels that prevailed in 1999 is very low. In recognition of the fact that 70 % of the crude oil export are utilised in the transport industry, our country's faces a major challenge of finding alternative energy resources for transportation use.

The alternatives that exist for us to resolve the issue include increasing the supply of oil products from a non-oil source, switching from an oil-based fuel to one not made from crude oil and/or introducing policies that will reduce the consumption of oil-based fuels. The supply of oil products from non-oil source can be achieved through the conversion of Gas-to-Liquid, production of fuel ethanol from new crop plantings, production of biodiesel from crop, the use of ethanol gel and fuel cells.

Of the list presented above, biodiesel offers a huge potential not only in its ability to contribute to the reduction of our country's reliance on crude oil but also in supporting local economic development. Given that biodiesel contains around four times as much energy per litre as it takes to grow and manufacture a litre of biodiesel, it remains an attractive energy source for our public transportation industry.

One of the potential economic impacts of biodiesel production will be more employment in agriculture and other supporting industries. Overall, the building up of the BioEnergy industry could lead to more employment and to a more efficient production of energy. In addition to this, using biofuels instead of fossil fuels can help lower the environmental damage. There is currently a school of thought that argues that our agricultural sector has the potential to produce more than 1.4 billion litres of biodiesel per annum from various oil seed crops without having a negative impact on food production. This could make a contribution of more than 20 % towards South Africa' diesel consumption. If this argument is valid this will also offset the importation of oil cake, glycerol and seed cotton, saving the country R1 billion/annum on imports.

On the policy side, the options that exist are raising fuel taxes, improving vehicle efficiencies, moving from road to rail transport, developing mass transit systems and improving spatial planning. It is in the area of policy initiatives that scope exists to reduce the demand for oil-based fuels and achieving a switch from petrol to diesel.

The challenges that exist in the biodiesel production are the price obtained for the sunflower oil cake and the difficulty of obtaining finance for a biodiesel factory. Our government has committed itself to supporting the establishment and development of the biodiesel industry and is currently looking at appropriate methods for this. With the current crude oil prices, biodiesel cannot be manufactured profitably in South Africa without government incentives. To this end, our Finance Minister, in his 2002 budget speech, indicated that the country would encourage the development of environmentally friendly diesel fuels. He proposes the application of a levy at 70 % of the general fuel levy rate. Other provisions such as Road Accident Fund levy, off-road fuel levy concessions; the Southern African Customs Union excise duty and zero vat rating will apply as for other fuels.

While biodiesel production is considered to be a mature technology, there remain a number of significant technical and quality constraints that require resolution in order to ensure a sustainable use of this fuel. The success of the South African biodiesel initiative depends upon the degree of consumer trust and confidence that the technology can attract. Core to this is the need to develop a National Biodiesel Standard. An interdepartmental task group consisting of DST, DME, DTI, SABS and the National Treasury has already been established in order for us to set-up the support mechanism to develop the biodiesel industry.

We also recognise that developing countries need to invest in R&D. It is essential that levels of investment by Governments in civilian R&D are increased and sustained for a significant period to develop the necessary human capital. Knowledge is the key to sustainable development and forums such as these offer us further opportunities in developing our country's human capital.

Thank you

Rapporteurs Note:

The new approach to research and development in South Africa focuses on improving the quality of life of all people through efficient wealth creation. It is a systematic approach, emphasising the importance of various factors influencing the efficiency of research.

To stimulate greater economic efficiency, it is essential to invest in local human resources, as opposed to paying large amounts of money in order to import knowledge into South Africa from other countries.

Today, South Africa faces an erosion of the Science and Technology base, because of low investment in the sector. In addition to the low investment in local knowledge development, there is the tendency to focus research activities on innovations, providing short-term returns, rather than on innovations for long-term gains. The current approach characterizes that of many countries in the developing world, where large expenditures are used for the importation of foreign skills and technology, which fail to provide long-term economic and information development in the region.

The contribution of technology for the sustainable development in countries such as South Africa include the following missions:

- support of the eradication of poverty, while effecting the rational consumption of limited resources,
- development of advanced manufacturing and logistics, including plant, equipment and machinery.

Additionally, there is a need to build stronger innovation networks with global players and to assist SMEs and BEEs to source technology globally in order to build innovation capacity in the Southern African Region through NEPAD, so that the region can be part of the developed world in all sectors of knowledge development.

Therefore, national governments must provide incentives to the private sector for the enhancement of their research and innovation capacity. Furthermore, the private sector need to be encouraged to promote information sharing and the exchange of know-how.

Concerning the energy sector it is crucial that the South African region develops renewable sources for a sustainable energy supply. The negative implications of energy importation in the region shall certainly be very significant in the future.

- high costs of imported energy
- low levels of developing renewable energy supplies and use,
- lack of sustainable energy supplies, where the poor will be most affected.

In conclusion, South Africa, including the subcontinent as a whole, must increase the scale and the impact of science and technological innovations in human development. This process can only be achieved through greater capital investment in local human resources and local technological capacity development, rather than in the importation of knowledge and technologies.

Joint Workshop by CARENSA – SPARKNET – LAMNET

Development of a Green Energy Certificate System for South Africa

Glynn Morris
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South Africa
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Information

AGAMA Energy, a green energy services company based in Cape Town, is to co-ordinate the supply of Green Electricity to the main venues at the World Summit on Sustainable Development (WSSD) between 24 August and 4 September 2002. This is a Department of Environment & Tourism initiative and is supported by the United States Agency for International Development (USAID).

Green Electricity, also called Green Power, is a growing worldwide phenomenon. Green Electricity is electricity generated in a sustainable manner from renewable energy resources such as wind, solar, wave, geothermal (heat from the core of the earth) and certain biomass (plant matter) and hydro energy.

South Africa has excellent renewable resources, and in regions like the Western, Eastern and Northern Cape provinces, which import the bulk of their energy, renewable electricity generation close to the demand makes good sense – including lower transmission costs, greater reliability and, of course, reduced environmental impact.

At present there is more than 50Megawatts of green generation capacity in the Southern African Power Pool – this is enough energy to fulfil the needs of 20 000 households. South Africa itself presently has a small and un-coordinated installed capacity of green generation plants, including the hydro plants in the Eastern Cape (owned and operated by Eskom) and a number of Independent Power Producers in KwaZulu-Natal and Mpumalanga.

The National Electricity Regulator (NER), national government's electricity 'watchdog', is developing certification criteria and procedures for any potential green power producer to obtain certification of their electricity production.

While there is as yet no mechanism for trading green electricity in a regulated market in southern Africa, a likely mechanism is 'green power certificates'. A green power producer (certified and monitored by the National Electricity Regulator) will acquire green power certificates for any green power supplied onto the national grid. Any distributor or supplier (also licensed by the NER) that desires to offer a green electricity 'product' will be able to buy green power certificates to back up the sales to discerning customers. Green electricity sales will be regulated within a green electricity tariff structure to be established and regulated by the NER.

In addition to its environmental, safety, water-saving and health benefits, Green Electricity offers opportunities for small investors and entrepreneurs.

The growth in electricity demand in South Africa is expected to outstrip the existing capacity within the next three to five years, and then there is the risk of what is known as "rolling blackouts". It is essential that South Africa creates new electricity capacity, and this means that we have a rare opportunity – to make an informed and considered choice about the sustainability of that electricity supply.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MM-1-Morris-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

LAMNET – A Global Network on Bioenergy – Strategies and Results

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LAMNET constitutes a transnational forum for the promotion of the sustainable use of bioenergy.

The activities of LAMNET include the analysis of existing energy policy frameworks, the assessment of energy demand and biomass resources, the analysis of available bioenergy technologies and systems as well as the development and implementation of policy options.

LAMNET focuses on the promotion of small- and medium-scale decentralised bioenergy systems and the large-scale implementation of bioethanol production and generation of heat and electricity based on sugar cane and other suitable biomass resources.

LAMNET consists of 49 institutions and organisations located in 23 countries within Europe, Latin America, Africa and Asia.

The efficient dissemination of the LAMNET activities is realised through the publication of a periodical newsletter and the establishment of a project web site (www.bioenergy-lamnet.org). Additionally, several workshops and seminars are being organised with participation of members of the Thematic Network and interested persons or organisations from Latin America and other European and non-European countries.

Overcoming Barriers to the Implementation of Bioenergy

Many bioenergy projects are technically feasible today, but investments do not proceed because other forms of energy are more cost competitive. High cost is the most significant barrier to achieving an increased uptake of biomass. The removal of barriers to implementation is a challenge for developers and policy makers in order to increase the sustainable use of bioenergy systems. Faster uptake could be made by offering a number of incentives:

Economic Instruments

- Carbon taxes imposed on a society in order to increase the costs of fossil fuels
- Climate change levies on electricity sales,
- Carbon trading offering additional value to bioenergy projects
- Long-term feed in tariffs in order to stimulate the renewable energy market
- Grants and subsidies offered by governments
- Increased depreciation rates on plant and equipment for tax purposes
- Reduced excise taxes to the use of fuels with a biofuel component

Non-economic Instruments

- Targets set by governments for new renewables
- Green electricity markets enabling retailers to trade the renewable energy certificates after generation. The green certificate value can be capped by imposing a penalty for not meeting the green electricity targets.
- Education and access to information about the problem of GHG emissions in order to create greater awareness and encourage companies, communities and individuals to be prepared to act

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MM-2-Janssen-LAMNET-WS-Durban)

A GLOBAL NETWORK ON BIOENERGY – OBJECTIVES, STRATEGIES AND FIRST RESULTS

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ABSTRACT: In order to promote the sustainable use of biomass in Latin America and other emerging countries it is the general objective of this Thematic Network to establish a transnational forum of Knowledge Centres (Universities and R&D Institutes) and SMEs from Latin America and other emerging countries and the European Union. The activities of the Thematic Network include the analysis of existing energy policy frameworks, the assessment of energy demand and biomass resources, the analysis of available bioenergy technologies and systems as well as the development and implementation of policy options for the promotion and deployment of bioenergy. The main focus will thereby be on the promotion of small- and medium-scale decentralised bioenergy systems and the large-scale implementation of bioethanol production and generation of heat and electricity based on sugar cane and other suitable biomass resources including agro-forestry residues.

Keywords: bio-energy policy, sustainable use of biomass, bio-ethanol

INTRODUCTION

Good management of resources, alleviating poverty and improving the socio-economic conditions of living as well as the identification of sustainable technical and economical schemes are key objectives for research and development efforts in emerging countries and the EU partnership with emerging countries. Projects focussing on scientific co-operation and policy research in general and especially in the field of renewable energies are of great importance today, as the European Commission recognises that the creation of suitable policy frameworks is required prior to the development of more advanced technologies in order to successfully tackle the main challenges of sustainable development.

In the past the political dimension and the international role of science was often limited to specific fields like aviation and space, nuclear energy and oil. Today, it is agreed upon that science forms the 4th pillar of External Relations together with the fields of politics, trade and international co-operation. Therefore, scientific co-operation and the linkage of scientists, decision makers and entrepreneurs in Thematic Networks is expected to gain an ever increasing importance in the relation between the European Union and countries from Latin America, Asia and Africa.

In order to contribute to these objectives this Thematic Network is funded by the European Commission in the framework of the specific research and technological development programme 'Confirming the International Role of Community Research'.

OBJECTIVES AND STRATEGIES

The main objective of this global Thematic Network is to establish a transnational forum for the promotion of sustainable use of biomass in Latin America and other emerging countries. This network of 48 institutions (Knowledge Centres and SMEs) from 24 countries worldwide is set up to face urgent needs for improved and regionally adapted bioenergy applications.

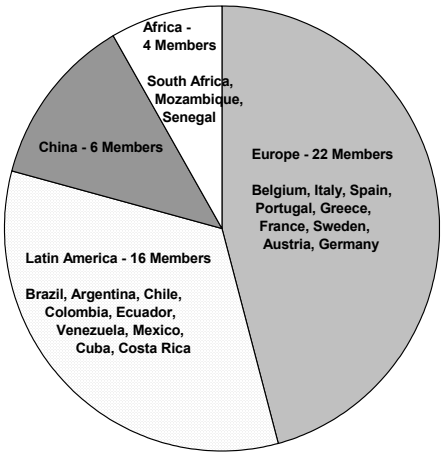

Figure 1: Membership of the Global Network

The focus of the project will thereby be the identification of technological objectives and the development of policy options to boost deployment of decentralised biomass production and biomass based energy generation. Concerning the large-scale promotion of bioenergy and the realisation of significant benefits from the deployment of modern, efficient and sustainable bioenergy systems in Latin America and other emerging countries the following key Thematic Priorities have been identified and will be addressed during the implementation of this project.

Analysis of the energy policy framework

In order to facilitate the elaboration of suitable policy options for the promotion of bioenergy it will be essential to directly address existing national and regional energy policy frameworks and to assess benefits and drawbacks of existing bioenergy programs.

Energy policies in emerging economies should aim at the strengthening of energy and power infrastructure, the diversification of economy in order to reduce the dependence on petroleum and the exploitation of alternative energy sources including renewable energies.

The contribution of bioenergy to the realisation of these objectives can be significant due to the large potential of biomass resources. Moreover, the production of liquid fuels from biomass can help to reduce the dependence on petroleum especially in the important sector of transport, and small-scale decentralised biomass power generators can improve the energy supply of remote villages in rural areas.

Assessment of energy demand and biomass resources

The assessment of quantitative and qualitative energy demand of various actors in society will address the specific needs of villages, families, SMEs, industries, transport and public infrastructure (hospitals, schools, tourist resorts etc.). Special emphasis will be given to the assessment of current and future primary energy consumption of the heat, electricity and transport sector as well as the demand for high quality fuels for transportation. Additionally, an analysis of local market prices for various energy sources will be performed and economic opportunities, income generation and local rural development options will be identified.

The present and future resources for the use of biomass will be assessed in order to indicate possibilities to meet demand with locally available resources. An important aspect to be addressed is an increased availability of biomass resources. This can be achieved by an enhanced recovery of various agro-forestry residues and the plantation of dedicated crops on surplus, marginal soils.

Analysis of available technologies and systems

Suitable and practicable technologies and systems for bioenergy production will be investigated for application in emerging countries. Relevant technologies and systems will be selected on the basis of maturity of the technology, cost-effectiveness, simplicity of maintenance, social acceptability and the impact on development.

Moreover, the benefits in comparison with conventional energy supply and the possibility of local production of the technology will be taken into consideration. The main aim is thereby to develop efficient and cost-competitive solutions for the conversion of biomass to energy services and the focus of the activities of the global network will be on the following thematic priorities:

- Small, medium and large scale biofuel (e.g. bio-ethanol, vegetal oil) production
- Small, medium and large scale cogeneration and trigeneration
- Small and medium scale biogas and charcoal production
- Gas generation from agro-forestry residues
- Combustion and co-combustion technologies; Low pollution stoves
- Technologies for the conversion of biomass crops and residues in pellets and briquettes
- Integrated Bioenergy complexes in emerging economies
- Comparison with conventional energy supply with respect to cost-effectiveness, simplicity of maintenance, social acceptability, impact on development

Development of policy options for the promotion of bioenergy

Based on the identification of the energy policy framework and the technical conditions to meet the demand with local resources, policy options for the promotion of bioenergy will be elaborated. In order to indicate sound technical solutions, an involvement of local authorities, project responsibles, decision-makers on the one hand and the Network of Knowledge Centres and SMEs on the other hand has to be assured. The following thematic priorities will be addressed in the framework of this global network:

- Potential and barriers for CDM (Clean Development Mechanism) projects, Joint Implementation and carbon trading
- Strategies for biomass trade (e.g. biofuels)
- Analysis of successful projects/programs (best practice) of biomass use in Latin America, China and Africa including problems faced and overcome
- Programs for the use of modern biomass fuel in the transportation sector
- Promotion of international co-operation (e.g. Int. Governmental Coalition on Bioethanol)
- Potential and barriers for technology transfer and joint-ventures
- Economic aspects of the promotion of bioenergy (financing and loan schemes, credit mobilisation, investment capital, market penetration)

Implementation of Policy Options for the Promotion of Bioenergy

In order to implement the proposed policy options the global network will assure that they are elaborated in consultation with and are widely disseminated among local authorities, decision-makers, utilities, project responsibles, private investors and communities of highly motivated people.

The network will contribute to the promotion of joint-ventures and technological co-operation activities and to the identification of potential demonstration (best practice) projects.

Emphasis of the network's activities will be laid on the design and screening of Joint Implementation and CDM project candidates as well as the elaboration of training programmes and awareness campaigns in the fields of operation and maintenance, financing and management.

PROJECT RESULTS

During the 'kick-off' meeting of the global network on bioenergy in Brussels in March 2002 it was concluded, that the network's activities regarding the promotion of bioenergy utilisation in emerging countries will mainly focus on the following topics:

- Promotion of small and medium scale decentralised bioenergy systems such as advanced pelleting/drying technologies, small plants for co-generation and refrigeration systems, syngas generators, micro-distilleries for ethanol production, charcoal pellets, activated charcoal for water purification. These small-scale bioenergy systems are strongly supported by the European Biomass Industry Association (EUBIA), as the penetration to markets of small scale systems is expected to proceed at a faster pace due to the lower investment level and the reduced required supply of biomass resources.
- Large scale implementation of bioethanol production and generation of heat and electricity based on sugar cane and other suitable biomass resources (e.g. sweet sorghum) and the creation of a global bioethanol market.

In the long term the potential worldwide production of bioethanol is estimated to be at least 2 billion tons per year (t/y), with 0.5 billion t/y from sugar/starch crops and 1.5 billion t/y from lignocellulosic biomass. In order to achieve large market penetration the price of bioethanol has to decrease to approximately 250 US$ per ton. At this price level bioethanol will become an alternative commodity of strategic interest for the transport sector due to its high energy content, its potential contribution to a sustainable energy supply, its socio-economic impact for rural population and its multitude of applications. Thereby, the future market penetration of bioethanol is estimated to amount to 550 million t/y in the transport sector (20% of the present consumption), about 500 million t/y in the heat and power sector (10% of the total worldwide power plants), 200 million t/y for the production of industrial chemicals and several 100 million t/y for domestic markets [1].

Today, the largest producer of bioethanol is Brazil, where ethanol produced from sugar cane is continuously used as automobile fuel since 1975. Ethanol production in Brazil (14 billion litres) is divided between anhydrous alcohol (6 billion litres) and hydrated alcohol (8 billion litres) and the ethanol consumption in the transportation sector is roughly equivalent to 45% of the gasoline consumption. Anhydrous alcohol is blended with gasoline and used in conventional engines, while hydrated alcohol is utilised as neat alcohol in adapted engines. Ethanol use as neat fuel has declined in Brazil during the last 10 years, whereas the consumption of anhydrous alcohol has continuously increased. Thereby, the total demand for ethanol in the transportation sector has slowly diminished due to structural problems of the Brazilian Alcohol Program (PROALCOOL) and currently no national policy exists ensuring the long-term sustainability of the Program. The reduction of the contribution of renewable energy sources to the Brazilian energy system will continue unless a global effective policy for renewables will be implemented such as the creation of a global ethanol market with the involvement and commitment of a large number of countries. According to the Centro National de Referência em Biomassa (CENBIO), Brazil, it will thereby be necessary to focus on large scale markets (e.g. bioethanol) in order to develop sustainable economies of emerging countries, whereas decentralised, small scale energy systems may contribute to the reduction of poverty in rural areas of the world [2].

Additionally, there is a key interest in various sugar-producing countries (e.g. Brazil, Cuba, Mexico, Kenya, South Africa, Thailand) to exploit the large potential of sugar cane bagasse resources for the generation of electricity and heat [3]. Bagasse based co-generation is in line with policies implemented by national governments in order to diversify electricity generation by using indigenous resources. Cogeneration units thereby constitute an attractive option for financing through Clean Development Mechanisms (CDM). In Brazil, for example, among several policies under discussion, the implementation of a large scale co-generation program for the sugar/ethanol sector is regarded as a favourable option for both its environmental and social impact. Furthermore, revenues from electricity sales could lead to a further reduction of the alcohol production costs and accelerate the large scale market penetration of bioethanol [4].

Sugar cane has been grown and milled in the Southern African region for centuries. The Southern African Development Community comprising the sugar producing countries Malawi, Mauritius, Mozambique, Swaziland, South Africa, Tanzania, Zambia and Zimbabwe constitute one of the world's largest sugar producing areas with an average annual production of 3.8 million tons.

Nevertheless, there are still mayor constraints to the large-scale market penetration of sugar cane based bioenergy production in Southern Africa. Among these are the state-controlled electricity supply, offering low revenues for the producers of bioenergy and obstructing the access to the local grid as well as the large investment costs required to up-grade boilers and/or generators for heat and power generation at sugar mills. Therefore, it is regarded as a promising option to take the opportunity to use Carbon Credits to kick-start co-generation in sugar mills operated by Illovo Sugar in Southern Africa [5].

With respect to the various options for the implementation of sustainable biomass use in Latin America and other emerging countries it is the aim of this Thematic Network to develop suitable policy options for the promotion of bioenergy, which carefully take into account the specific local and national framework conditions as well as demand and available resources. Thereby, it is essential to combine the expertise of different stake-holders such as policy makers, donors, investors, private sector entrepreneurs and scientists in order to reach truly sustainable and sound bioenergy based development opportunities.

EVENTS OF THE THEMATIC NETWORK

The first workshop of the Thematic Network was organized as a Conference Related Event on the occasion of the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection, Amsterdam, 17-21 June 2002. This workshop constituted a platform for dialogue between the members of the network and interested delegates who were interested to benefit from a group of international experts working on the application of bioenergy in Latin America and emerging countries.

The second project workshop will take place in Durban, South Africa, 19-21 August 2002 and will be organized in close co-operation with the project partner Illovo Sugar Ltd. This workshop will include a technical tour to a sugar mill operated by Illovo Sugar Ltd and the thematic focus will be on ‘Bioenergy from sugar cane bagasse’ and ‘Rural energy – woodfuels, charcoal and household issues’.

CONCLUSIONS

This global network on bioenergy has successfully started to establish a transnational forum for the promotion of sustainable use of biomass in Latin America and other emerging countries. The main activities of this Thematic Network will comprise the development of policy options for the large scale implementation of bioethanol production based on sugar cane and other suitable biomass resources (i.e. sweet sorghum) as well as for the promotion of small and medium scale decentralised bioenergy systems, in particular small scale village complexes suited to perform an integrated full processing of agro-forestry residues and dedicated crops [6].

In order to realise these objectives several workshops and seminars will be organised in the framework of this project. These events will be organised under participation of members of the Thematic Network and interested persons or organisations from Latin America and other emerging countries.

Information on project activities including workshops and seminars are available at the project website www.bioenergy-lamnet.org and at www.wip-munich.de and www.etaflorence.it.

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Joint Workshop by CARENSA – SPARKNET – LAMNET

Activities of the Cane Resource Network for Southern Africa

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The Cane Resources Network for Southern Africa (CARENSA) will demonstrate the role of sugarcane resources in supporting sustainable energy solutions and improving economic competitiveness within the sugar industry and its affiliates in southern Africa.

The network brings together researchers, policy-makers, and industry representatives in a series of workshops and exchanges to evaluate technical, socio-economic, environmental, and policy aspects of alternative cane resource scenarios for the region.

The project team will compare current practices to the state-of-the-art and develop a set of performance benchmarks and implementation strategies for the region. Close co-operation between industrialised and developing country participants facilitates an improved understanding of the technologies, markets and policies through which the sugarcane agro-industry can address the demands of globalisation while pursuing the goals of sustainable development.

CARENSA was launched in September, 2001 and will continue until 2005. The four-year research on sugar cane energy development in Southern Africa, will produce five thematic reports, including various publications over its life span.

The choice of developing bioenergy from sugar cane comes from the fact that:

(a) sugar cane is an excellent converter of solar energy,

(b) sugar cane has an excellent energy balance for bio-ethanol production,

(c) it is mainly found in developing countries, whose economies depend on the performance of the sugar industry, and finally

(d) the importance of the sugar cane industry in the south can provide an opportunity for sound and profitable cooperation between the North and the South.

The CARENSA project will operate in the southern African region focusing on countries like South Africa, Zimbabwe, Mozambique, Zambia and possibly Swaziland.

Cane production from the SADC countries accounts for about 3.5% of global sugar production, where by far South Africa is the largest producer. Mauritius, Zimbabwe and Swaziland are also major producers of sugar cane in the region, using cost-effective methods.

Aim and objectives

The aim of the CARENSA project is to develop performance benchmarks for sugar cane production, harvesting and delivery in Southern Africa, where southern Africa is comprised of South Africa, Zimbabwe, Mozambique, Zambia and possibly Swaziland.

To achieve both goals of the project, a comparative assessment of the next identified aspects of sugar cane production in southern African countries shall be performed. The aspects include a preliminary review of:

(a) sugar cane agronomic,

(b) harvesting, as well as the

(c) delivery practices of sugar cane in South Africa.

In the progress of the work, there will be additional aspects included in the analysis. The primary aspects of sugar cane production shall be assessed from the perspective of whether they will need to be modified under different scenarios of (a) the proportion of yield being used for purposes other than sugar, (b) land tenure, and (c) *climatic variability*.

CARENSA is to assess the potential of sugar cane energy for effective contribution towards sustainable development of the southern African region, while identifying strategies to improve the competitiveness of the sugar industry over the subcontinent as a whole. The assessment shall include the comparative evaluation of sugar cane organizational and institutional dimensions, technical features as well as the integrated impacts of the project in all parts of the region. The strategy is to add value through optimising output diversity from sugar cane resources.

The CARENSA project is not involved in research, but literature review of the relevant parameters set to influence the sugar cane bioenergy industry in the region.

Components of the CARENSA Project

The project has the following components:

1. **Agriculture**: sugar cane agronomy and harvesting aimed at optimising dry biomass yields and total feedstock for bioenergy production.

2. **Industry**: the focus in the assessment and evaluation of the sugar cane fibre resource streams, agro-industrial processes as well as the bioenergy processing technologies suitable and competitive for use in the bioenergy development process in the region.

3. **Markets**: the viability of the sugar cane energy development in the region certainly depends on the product demands and long-term demand growth, while acknowledging the important influence of policies on the viability of the sugar cane energy industry.

4. **Impacts:** to determine the viability of the project requires detailed assessment of the integrated impacts of the initiative as a whole at the different scales of operation and development.

5. **Integration:** the integration process entails the assessment and evaluation of the sugar cane bio-energy development on sustainable development, associated risks, industry requirements, technological imports, and also industry competitiveness with respect to diverse elements and linkages of the network.

The potential driving forces towards the formulation of the CARENSA project include:

- the need for competitive rural development,
- the increased pressure on limited land resources from increasing human population and demands,
- the need for energy security where the supply of fossil fuels is externally controlled and regulated,
- better environment for good human health,
- enhanced output diversity in the sugar industry improving the future competitiveness
- the need of identifying renewable and more efficient supplies of energy, rather than increasing dependence of expensive fossils fuels.

Although production of sugar cane in Kwa-Zulu Natal is largely dependent of rainfall, the most of the sugar industries are located in the region. Sugar cane production varies from below 70 ton per ha in some areas of Kwa-Zulu Natal to about 120 tons per ha in countries such as Swaziland, where sugar cane production is strictly under irrigation.

The planting seasons varies from one sub-region to another over the subcontinent as a whole, because of the differences in climatic conditions. More often high rainfall in one season decreases the growing period of the area. Countries like Swaziland have a relatively short growing period (26-28 weeks), while Kwa-Zulu Natal enjoys a longer growing period ranging between 38 to 42 weeks per year. South Africa sugar cane gives an average of 8-11% of sucrose content per ton, but can be as high as 14-15% sucrose content per ton of sugar cane in countries like Swaziland and Zimbabwe.

Funding and implementation

The European Commission's Directorate General for Research supports the thematic network in the amount of 500.000 EURO. The Stockholm Environment Institute (SEI) serves as Scientific and Administrative Coordinator for the Network. The project team was designed to place the key issues in their proper regional and global context, while also promoting north-south and south-south cooperation on cane resource development. There are four European organisations, four African organisations, three international or regional organisations, and two organisations based outside of Africa in the world's two largest cane-producing countries (Brazil and India), as listed below:

1) SEI, Stockholm Environment Institute
2) KCL, King's College, Life Sciences Division, London, UK
3) UM, University of Mauritius, Chemical and Sugar Eng. Dept.
4) UND, University of Natal, Durban, South Africa
5) AUA, Agricultural University of Athens, Greece
6) CIRPS, Interuniversity Research Centre on Sustainable Development, Italy
7) BUN, Biomass Users Network, Zimbabwe
8) CEEEZ, Centre for Energy, Environment, and Engineering, Zambia
9) ISO, International Sugar Organisation
10) FAO, Food and Agricultural Organisation (FAO), United Nations
11) WII, Winrock International India
12) CENBIO, National Reference Centre for Biomass, Brazil
13) SADC, Southern African Development Community

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MM-3-Johnson-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

SPARKNET – Objectives, Strategy and Activities

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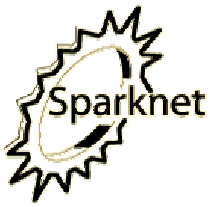

SPARKNET is a multi-stakeholder interactive Knowledge Network focusing on how people, in the context of acute poverty, can gain access to better energy services and improve their livelihoods.

The network makes available unique resources for policy makers, companies, and civil society on energy poverty in Southern and East Africa through the sparknet.info website.

Online resources are made available on the relationships between Health, Gender and Forestry and Energy, including detailed country reports, scenario analyses, and policy assessments. Online meetings and conferences will be held at regular intervals.

Through a network of associates in Africa and Europe, SPARKNET brings together 70 organisations and 115 people from research institutes, NGOs, Governments and private companies.

The world economy is still characterised by an unequal production, distribution and consumption of wealth between the North and the South. In developing countries, poor people do not even have access to basic services such as clean water, shelter, improved fuels for cooking and space heating Poor people are also experiencing severe food. Supply. Shortages and poor health cover. This economic marginalization is exacerbated by a lack of political power which contributes to the vicious circle of poverty. The challenge is how poor people, in a context of acute poverty, can gain access to better energy services and improve their livelihoods.

Basic energy services

The sustainable supply of improved and affordable energy services for meeting **household energy** basic needs is the first priority of poor people. It is also of vital importance in the reduction of poverty. Poor people spend up to a third of their income on energy, mostly for cooking.

Almost half the world's population still rely on biomass fuel – i.e. wood, charcoal, animal dung or crop wastes – and coal, for their everyday household energy needs. Although accurate data is scarce, estimates suggest that wood provides around 15% of the energy needs in developing countries, and as much as 75% in tropical Africa. In more than 30 countries, wood provides more than 70% of the energy needs, and in 13 countries it is over 90% (World Energy Council 1999). Over the last 25 years, the trend in global biofuel use has changed little, and in some parts of the world where poverty and the prices of alternative fuels such as kerosene and bottled gas have increased, the use of biomass has increased (WHO 1997).

With development, there is generally a transition up the so-called 'energy-ladder' to fuels which are progressively more efficient, cleaner, convenient and expensive. It is important to emphasize that households typically use a combination of fuels – for example, wood for cooking and heating, kerosene for lighting, and perhaps charcoal for making hot drinks. Thus, there is not a simple linear progression up this ladder, but it is nevertheless the case that households will tend to carry out more tasks with more modern fuels as their socio-economic circumstances improve. However, the problem remains that almost half of the world's population relies predominantly on fuels at the lower end of this energy ladder, and, for many, the prospect of moving up the ladder in the short term appears limited.

Social, economic and environmental recognition of the biomass dimension

It seems that on the micro economic level where women and young girls collect firewood, usually "free" of charge, the tremendous amount of effort and time is not adequately recognized. But also where firewood and charcoal are purchased – mainly through the informal sector – prices do not reflect production costs but merely the costs for harvesting and transport. However, in urban households costs for buying fuel wood represent a significant share of their low income. Recent studies in Africa assessed that for many households the required energy supply is almost as expensive as the basic food supply (Habermehl 1994).

Also the macro economic costs of fuel wood scarcity are not fully recognised: e.g. the fact that women´s work force is not available for productive activities (agriculture, small scale business) and reproductive activities (education, child care, family nutrition) if they spend so much time on fuel wood collection. Data of environmental costs for over utilisation of forest resources are mostly not well known and hardly considered

Poverty and indoor air pollution

Poverty remains a very important, probably the most important, determinant of health, underlying all other issues discussed so far – and this is clearly demonstrated by the close inter-relationship between household energy, poverty and health. Reliance on simple biomass fuels holds back development because it impairs health and restricts opportunities for education and income generation.

In these poor rural and urban homes, biomass fuels and coal are typically burnt in open fires or poorly functioning stoves, often indoors, with inadequate ventilation for the smoke. This leads to very high levels of pollution in the homes where especially women and young children are exposed on a daily basis.

Indoor air pollution is the clearest and most direct physical health risk, and there is now fairly consistent evidence that biomass smoke exposure increases the risk of a range of common and serious diseases of both children and adults (Bruce et al, 2000). Chief among these is childhood acute lower respiratory infections (ALRI), particularly pneumonia (Smith et al, 2000). There is also evidence, mainly from China, that exposure to coal smoke in the home markedly increases the risk of lung cancer, particularly in women.

In recent years, new evidence has emerged which suggests that indoor air pollution (IAP) in developing countries may also increase the risk of other important child and adult health problems, such as low birth weight, perinatal mortality (stillbirths and deaths in the first week of life), asthma, and middle ear infection in children, tuberculosis, nasopharyngeal and laryngeal cancer, and cataract in adults (Bruce et al, 2000).

Household energy and gender

Household energy is usually equated with cooking. In households where there are adult men and women, the gendered division of labour generally allocates to women the responsibility for household energy provision related to their spheres of influence in the household, in particular activities centred around the kitchen. However, men become involved in places where fuel has to be collected from long distances, fuel is purchased or there are social restrictions on women leaving their homes.

Energy use in rural areas differs significantly from that in urban areas. In the former, there is a particularly heavy reliance of households on biomass as an energy carrier for process heat. In addition, there is a lack of access to reliable supplies of modern energy forms at affordable prices. Biomass is obtained at zero direct monetary cost, although there are time and environmental costs. Biomass production is integrated into local land-use management systems which balance ecological sustainability with the provision of a range of goods.

To increase biomass supply therefore requires an integrated approach to providing solutions. Access to the production system is restricted by rules and regulations that govern the local management of common property resources. It is not a system which responds well to the supply driven, market orientated policies of increased fuel production. Control of, and access to, this system have a distinct gender dimension. In any society, women have different access to and control over resources than men which influences their ability to adopt strategies to respond to changes in their circumstances. For example, increased time to collect biomass for household needs could be addressed by planting trees for fuel, however, women do not usually own land and where they have access to land, they may not have control over what is planted.

Household energy and income generation

The informal sector provides employment for many women men and children at household level. This is especially true for women, for whom income generation is particularly important. It is estimated that between 30 and 60 % of all micro enterprises in Latin America and the Caribbean are owned and operated by women. Lessons from various female led enterprises world-wide, show that many are performing relatively well in competitive markets. Much of this employment is at household level such as food for sale, fuel supply provision, ceramic stove production and installation etc.

Women-headed enterprises are frequently located in the home. These "cottage industries tend to be concentrated in a relatively narrow range of activities, with disproportionately low rates of return compared to what men earn: beer brewing, knitting, dress making, crocheting, palm oil processing, soap making, hairdressing, metal working, pottery making, basket weaving, cane work, spinning and textile production and retail trading. Cottage industries play an important role by providing a significant range of products and services for the local market. Despite the low financial returns, women's enterprises provide important sources of household income, even in male-headed households. One of the advantages for women working from home is that it allows them the opportunity for combining business activities with other domestic responsibilities.

Developing financing mechanisms

The up-front capital is a key constraint which could be to a large extent overcome if from the outset, it is addressed taking into consideration the resources (human, financial, technical, managerial etc.) of the communities. Even though alternative energy options, particularly from renewable, could be more cost effective over the long run, the up-front capital is a key barrier to the entry for poor people. Subsidies cover only part of the costs and cannot be sustainable within a long term strategy. The development of improved energy services will require leverage funds from many sources. Appropriate financing and subsidies can give low income communities, households or entrepreneurs the ability to afford to invest in new energy technologies. Achieving this aim will require a sustained effort by the international community, as well as new local partnerships involving NGOs and private sector.

Conclusion:

- Addressing household energy issues offers opportunities for time and labour saving, income generation, health improvements and social empowerment.
- The lack of improved energy services combined with very low efficiency and over-use of biomass have an adverse impact on bio-diversity, health and on the overall quality of life of poor people.
- There is an increase understanding that poor people's livelihood is likely to depend upon a mix of natural resources, social capital than a single source of income . This thinking implies the understanding of the relationships between the various sectors as well as the impact of policies, institutions and processes.
- A marked change in policy on household energy is required to improve this situation in short to medium term for the majority of rural poor in many countries.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MM-4-Khennas-LAMNET-WS-Durban)

Monday Afternoon Session: Biomass, Rural Energy and the Environment

Joint Workshop by CARENSA – SPARKNET – LAMNET

CDM Opportunities in Southern Africa, and the Role of Bio-Energy in Contributing to a Sustainable Regional Energy Mitigation Scenario

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Abstract:

The paper initially establishes the present status quo, baseline in the energy supply in the region, and its projection into the future. The baseline established is based on the region's energy supply based on the power sector collaboration – the Southern African Power Pool (SAPP). It later discusses a proposed mitigation scenario for the region. The scenario, which goes up to the year 2050, has a demand of 45.8 GW in 1995 and increases to 101.7 GW in the year 2050. The demand in the year 2050 is met by a combination of coal (60.3%), hydro (32.6%), natural gas (0.6%), biomass (0.48%), nuclear (1.5%) and diesel/gas turbines (0.2%).

As can be seen from this scenario, the role of renewables and advanced fossils fuel technologies is on the low side. The paper therefore proposes a sustainable mitigation scenario which takes into account the role of bio-energy from bagasse, agricultural and indusial waste. The driving force for this scenario is influenced by the security of supply, industrial competitiveness and poverty reduction/sustainable development. Inclusion of bio-energy goes along way to establish a more sustainable mitigation scenario.

Based on the sustainable mitigation scenario proposed, a number of projects can be developed which can attract partial project finance under the Clean Development Mechanism (CDM) through advanced sale of carbon credits. In addition, such projects will have improved revenue streams (IRR and NPV) through sale of the remaining carbon credits.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MA-1-Yamba-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

Cane Co-products as a Sustainable Bioenergy Source Portfolio

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Abstract

Sugarcane is one of the most promising agricultural resources of biomass energy in the world. It is mostly found in a belt that geographically covers a large extent of developing countries (tropical and subtropical climates).

Cane resources could be converted to a diversity of energy carriers –electricity, liquids and gases for transport and stationary uses, and heat. The two most economically significant co-products are ethanol and electricity. The wide variety of commercial products that can be produced from cane resources can be marketed domestically, regionally and internationally.

Further than only economic benefits, sugarcane offers the potential to support sustainable development with local, regional and global benefits. However, the use of cane resources in a sustainable manner most also confront with challenges and constraint, particularly those originating from the socio-economic side.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File : PPT-MA-2-Morales-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

National Alcohol's Programme for Colombian Gasolines

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Abstract:

Colombia considers the production of renewable fuels as a very good opportunity to link the agriculture sector to the production of fuels for transportation with high employment generation, better quality of life and better income for farmers future generation. For this reason CORPODIB is conducting research looking for biofuels obtained from agriculture to oxygenate fossil fuels like gasoline and diesel.

CORPODIB has been working in the development of the National program of ethanol from biomass for the oxygenation of Colombian gasoline during the last seven years. The following are some issues taking in account in the different projects related with the National Alcohol Program for Colombian Gasolines

- Plant design
- Fermentation
- Drying of ethanol
- Energy consumption
- Solid and liquid disposal
- Social and environmental studies
- Agriculture practices (sugar cane varieties with maximum total sugars content for optimum ethanol production).

We are working hard in the vinasse treatment to be useful as energy and fertilizer source. There will be no vinasse production. The ethanol production will be 2.5 million liters per day (900 million liters per year) from sugar cane juice and molasses.

CORPODIB supported an advanced project law to the Colombian Congress approved on September 19th/2001. The Law 693, signed by President of Colombia mandates to blend 10% of bioethanol from sugar cane with Colombian gasolines and diesel fuel oil

The following are the environmental and technical topics of the project:

- In addition to environmental benefits, the project will save 6 million of tons of CO_2 per year which through the Clean Development Mechanisms (CDM), of Kyoto Protocol will permit □luidised□ise CO_2 bonds.
- CER´s through Clean Development Mechanisms (CDM) will increase Discount cash flow rate of return in dollars DCFROR of approximately 5-10%.
- 150.000 new hectares harvested in sugar cane in different Colombian regions near the main cities or towns.
- Construction of 9 biorefineries with a capacity of 200.000 – 250.000 liters/day.
- Generation of 170.000 new agro employments (direct and indirect) which will positively contribute to the eradication of illicit harvests and governmental peace programs.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MA-3-Cala-Hederich-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

Bioenergy in Rural Areas of Developing Countries – Challenges in the Context of Globalisation

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Four main components of the human development paradigm

- Productivity, referred to economic growth as a subset of human development;
- Equity, in terms of equal opportunities;
- Sustainability, focusing on the access to opportunities for present and future generations;
- Empowerment, with regard to the requirement of full participation of people in the decision making process.

Three dimensions of sustainable development(SD)

- *Economic sustainability* assumes that social and environmental dimensions of sustainable development must be defined with economic considerations (i.e. economic efficiency in resource allocation) in mind;
- *Social sustainability* assumes that economic and environmental dimensions must be defined by taking into account social considerations (i.e. intragenerational and intergenerational equity);
- *Environmental sustainability* assumes that the economic and social dimensions must be defined by considering environmental constraints.

Main lessons for sustainable development(SD)

- Integrative approach => SD as a multidimensional process => economic, social and environmental sustainability
- Long term perspective, Intragenerational and intergenerational equity.
- Consistency with the priorities of most of the regional population
- The role of the State in SD policies.
- Synergies between basic areas of human development (energy services, education, health services, food security, etc.).
- Governance => stable political environment, responsible government, and social values oriented to equity.

Sustainable energy

According to the *World Energy Assessment 2000*, sustainable energy refers to that energy which is produced and used in such a way that supports human development with a long term perspective, considering social, economic and environmental dimensions.

New energy paradigm

Promoting energy saving and renewables (including bioenergy) => Technological transformations:

- to mitigate the adverse impact of energy sector on the environment.
- to reduce the economic vulnerability derived from the dependency on fossil fuels.

Obstacles and barriers for bioenergy in the context of neo-liberal globalisation

- Current policies tends to underestimate renewable energy sources, as bioenergy => in many cases, biofuels are often neglected in political, economic & social agendas (for instance, the New Energy Policy of USA, May 2001).
- Adverse implications of large-scale privatisation projects in the energy sector.
- New trade initiatives as the Free Trade Agreement for the Americas (FTAA).

The Latin American case

Latin America is the most urbanised developing region. However, 60% of the population depends on firewood and charcoal as domestic fuels. In general, traditional use of biomass fuels accounts for more than 30% of total energy requirements in the poor countries of the region such as El Salvador (35%), Nicaragua (42%), Paraguay (50%), Honduras (55%), Guatemala (62%) and Haiti (75%).

Bioenergy in rural areas of developing countries

a) Economic dimension
- Rural development (rural income) and Agriculture.
- Energy services (renewable energy source => widely distributed & locally available).
- Technology (new technologies for the utilisation of bioenergy as industrial energy source at competitive prices).
- Efficiency & safety.

b) Social dimension
- Poverty alleviation and Population development.
- Health, Food security and Water availability.
- Gender approach and Cultural perspective.

c) Environmental dimension
- Sustainable forest management and Biodiversity conservation.
- Mitigation of Climate Change and
- Land Use

Promoting Bioenergy requires

A. Multidimensional Analysis (reference to the multipurpose uses of biomass, the multidimensional character of the problems associated to the unsustainable use of traditional fuels in rural areas of developing countries, etc.) => To consider the economic, social and environmental dimensions.

B. Policies and supportive programmes:
- Global context (Equity Issues, Technology Transfer, Co-operation)
- National context (Capacity building, national priorities)
- Local context (community participation)

Proper consideration of potential & barriers for each case.

C. Technological Component in Response Strategies:
- Supply side (provision of bioenergy).
- Demand side (bioenergy use).

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MA-4-Pichs-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET – LAMNET

Biomass Energy and the Technology Development in China

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Abstract:

It is well known that China is a large agricultural country and 70% of the total people are living in rural areas. Biomass is one of the major energy resources in rural areas and occupies an important position in the national energy structure. China is rich in biomass resources: straw: 720 million tons/year; firewood: 127 million tons/year; livestock wastes: 130 TCE/year; urban wastes: 120 million tons/year. The total amount of biomass resources in China is about 700 million TCE. However, the resources are not properly utilized. It is estimated that the utilization ratio is only 30%, and the utilization methods are very primitive. At present, biomass is mainly used through direct burning, with the efficiency of less than 10%. Chinese Government is always attaching much attention to the development of biomass energy. The Ministry of Science and Technology has taken the research and application of biomass resources in the key research projects for the three consecutive Five-Year-Plan periods.

During the 8th Five-Year-Plan period, researches on biomass double-circulation □luidised bed gasification, straw gasification and central supply, biomass gasification for wood drying, biomass briquetting, straw direct burning, efficient livestock wastes anaerobic treatment. Meanwhile, technologies on ethanol from cellulose wastes and sweet sorghum stem, biomass pyrolysis and liquefaction, and energy utilization of vegetable oil were explored as well.

During the 9th Five-Year-Plan period, emphases was given to the research and development of 1 MW biomass gasification and electricity generation, straw gasification and central supply, efficient self-circulation organic waste water anaerobic treatment, high-concentration organic waste water anaerobic treatment, efficient anaerobic treatment of household wastes, and biomass catalytic gasification. Meanwhile, technologies on ethanol from cellulose wastes and sorghum juice entered the stage of medium-scale experiment, classification and survey of wild oil plants was carried out, and a breeding base was established.

So far, there are about 7 million household biogas digesters and more than 30,000 large- and medium-scale biogas digesters in China, with total volume of more than 1.37 million m^3 and biogas 9product of 55 million m^3. There are also 630 large biogas plants with volume of more than 100m^3, mainly used for treating livestock wastes and organic waste water. Besides, more than 300 gasification stations, over 100 sets of rice husk gasification and electricity generation systems, and 20 MW-level biomass gasification and electricity generation systems were constructed. Application of these technologies has brought considerable social, environmental and economic benefit.

In future, further efforts will be made to provide rural people clean energy resources and to improve rural living environment and rural people's living standard. In order to improve the value of biomass energy, technologies on conversion from biomass to high-quality energy resources will be developed. Mountain areas, wasteland, and desert will be used to develop new resources of biomass and establish energy farms and forests, and even biomass energy bases. At the same time, industrial utilization of biomass should be enhanced. Thus, the proportion of biomass energy in the total energy consumption will increase and the position of biomass in energy structure will improve.

During the 10th Five-Year-Plan period, the Ministry of Science and Technology will keep the development of biomass utilization technologies as key and preferable research projects. The focus of the 10th Five-Year-Plan Program will be on technological difficulties solutions and demonstrations of applicable technologies, including: 3MW biomass gasification and electricity generation system, 2MW

biogas electricity generation technology, and small biomass gasification and electricity generation technology. The 863 Program will emphasize on creative, far-insight, and exploring research of biomass utilization technologies. The projects that were granted in 2001 includes:

- 4MW biomass gasification and electricity generation optimised system, with demonstration, strengthening on technology creation and integration.
- Technology on ethanol from cellulose wastes, with demonstration of annual production of 600 tons of ethanol.
- Technology on ethanol from sweat sorghum juice, with demonstration of annual production of 5,000 tons of ethanol.
- Technology on biomass fast pyrolysis, with demonstration of annual production of 400 tons of pyrolysis oil.

Besides, 6 other creative research projects have been granted, involving ethanol fuel, biogas utilization and waste water treatment, pyrolysis oil, energy crops. Presently, the second batch of project application guides has been published on the internet, and some applications have been received.

Biomass energy resources will play an important role in sustainable energy development in future. For China, in particular, biomass energy has an essential strategic and practical significance. Exploitation of biomass resources involves rural development, energy development, environmental protection, resource conservation, state security, and ecological balance. We sincerely hope to obtain attention and support from international organizations, foreign governments and scientists. We will together carry out various forms of cooperation and exchange to promote the technological progress and, therefore, to accelerate the development of biomass energy.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-MA-5-Wang-LAMNET-WS-Durban)

Tuesday Morning Session: Bioenergy from Sugar Cane Bagasse

Joint Workshop by CARENSA – SPARKNET – LAMNET

Bagasse Utilisation at Illovo Sugar, Sezela Mill

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Illovo Sugar Limited is Africa's leading sugar producer and a significant manufacturer of downstream products.

Illovo's activities include agricultural, manufacturing and other interests in South Africa, Malawi, Swaziland, Zambia, Tanzania and Mozambique. Additionally, Illovo Sugar Limited produces sugar from beet at the Monitor Sugar Company in Michigan, USA.

Strategic Intent of Illovo Sugar Limited

- To be the leading sugar and downstream products operation in Africa, an increasing global player, and a world class organisation.
- To optimise the return on every stick of cane by adding value to its core commodity products - fibre, sugar and molasses. It will focus on its core business and develop material niche operations which add value.

Downstream Products

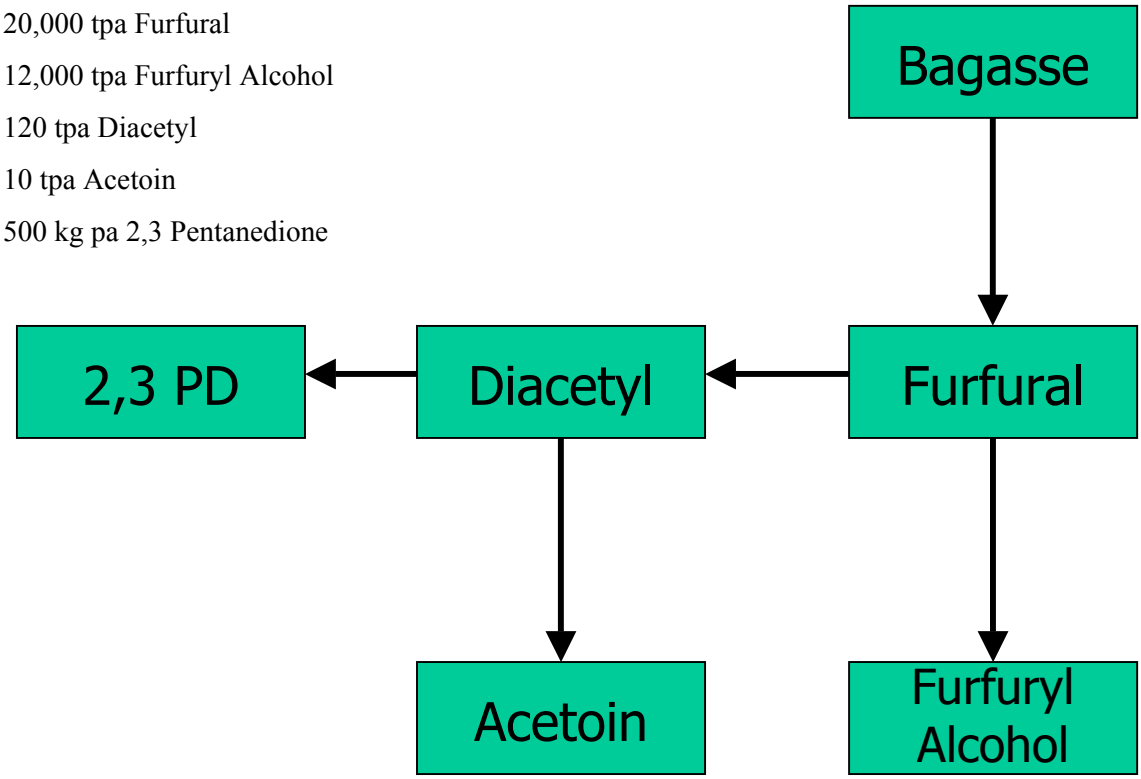
- syrup
- furfural
- furfuryl alcohol
- diacetyl
- acetoin
- 2,3-pentanedione
- ethyl alcohol
- lactulose
- dextran
- electricity

Sezela Sugar Mill

- Illovo Sugars largest mill
- 500 tons per hour crush rate
- 2,500,000 tons of cane p.a.
- 280,000 tons of raw sugar p.a.

Downstream Factory

- 20,000 tpa Furfural
- 12,000 tpa Furfuryl Alcohol
- 120 tpa Diacetyl
- 10 tpa Acetoin
- 500 kg pa 2,3 Pentanedione



Diacetyl Plant

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-1-Dalgleish-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Logistics on Pellet Production

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Abstract

Wood pellets are made of sawdust, which is dried and compressed. The reasons for such a refinement are to produce a biofuel that is homogenous, has high energy density and is possible to store over the seasons.

The common size of Swedish pellet plants is in the range of 20.000 – 100.000 ton pellets /year. Therefore, the raw material supply originates from rather big areas. Transport of saw dust can be over several 100 km, and is commonly utilising trucks. Since saw dust has a moisture content of around 50 %, it can only be stored during short times. The supply must therefore be continuously.

The main components in a pellet factory are:

- a mill that grains the saw dust into even smaller particles.
- a hot gas generator, which produces flue gases used to dry the material to approx. 10 % moisture.
- the pellet machine, that compresses the material into pellets. After the compressing, the moisture content is even lower, 6-8 % by weight.
- A separator, which removes fine particles from the pellets. The removed material can be used as fuel, or brought back to the beginning of the process.

With such a process, a heat surplus necessarily occurs. To improve the economy, pellet factories in Sweden are commonly connected to the district heating system in order to get an income also for the heat production surplus.

Pellets are used as fuel in all the effect range of boilers. Some of the biggest district heating boilers are fired with pellets, but before combustion, the pellets are grained into powder. The reason for using pellet instead of wet fuels is to reduce the transports and improve the possibilities for storing. New smaller boilers in the range up to 5 MW are commonly fired with pellets. In the effect up to 500 kW, a common solution is to attach a pellet burner to an existing boiler. In the real small scale, pellet stoves may be installed in houses with direct electricity heating.

The delivery of pellets are done by bulk trucks, if the customer has a storage that is big enough. Otherwise pellets can be delivered in big or small bags, or the customer can by himself buy pellets at the distibutor.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-2-Fjallstrom-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Advanced Pelleting Technology

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Abstract:

The process presented is vastly different from the conventional one. Its simplicity, the size of the equipment, its mobility and very low energy requirements make it superior to the fixed, energy hungry and complex multi-step process presently used. The approach dehumidifies and thickens in a single step not only all different kinds of biomass, but other waste products too, such as MSW and industrial sludge.

Introduction:

The pellet has well defined and constant characteristics. It is used in heat generation; in high performance boiler systems requiring a relatively modest investment. The use of such systems is also adequate for small to medium volume utilization. This allows a widespread application of biomass at the local level. For example, these systems can be used in districts and villages, and can easily be managed by the local participants. (E.g. in district heating; agricultural waste utilization in remote villages, etc.). Pellets can also be produced by appropriately mixing different woody materials with agricultural by-products. The resulting homogenised raw material can be used for heat generation in power stations.

The following list illustrates typical energy costs with their relative calorific content used in large industrial plants:

QUOTATION OF CONVENTIONAL FUELS:HYDROCARBONS

Product	Cost (EUR/ton)	Calorific Value(kcal/kg)
Fuel Oil	270	8,000
Natural Gas (untreated)	268	12,000
Gasoil (Italian cost)	817	10,000
Gasoil	370	10,000
Methanol	271	5,000
Coal	42	6,000

Average electricity cost in Europe, Industrial: 0,08 Euro/kWh
Average electricity cost in Italy, Industrial: 0,095 Euro/kWh

BIOFUEL QUOTATIONS (Year 2001)

Product	Total Humidity	Cost (EUR/ton)	Calorific Value(kcal/kg)
Woody Biomass (chips and branches)	30 to 50%	40 to 50 (ex plant)	2,200 to 2,600
Bioethanol		231	7,000
Charcoal		225	7,000
Biomethanol		300	5,500

WOOD PELLETS QUOTATIONS (YEAR 2001)

Product	Description	Total Humidity	Cost (EUR/Ton)	Lower Calorific Value(kcal/kg)
Industrial Use	Traditional Technology	10%	100/120 ex plant in big bags	3,800/4,200
Industrial Use	Traditional Technology	10%	140/170 average cost, ex distributor, pallets	3,800/4,200
Domestic Use	Traditional Technology	10%	250/270 customer's cost, in 15-20 kg bags	3,800/4,200

PELLETS COMPARED TO OTHER ENERGY SOURCES
(Equivalent prices for the same calorific content, in EUR/ton)

Product	Relative Calorific Multiple	Price in EUR/ton
Pellets	**1 (4,200Kcal/kg)**	**82**
Biomethanol	1.31	229
Methanol	1.19	228
Charcoal	1.67	136
Bioethanol	1.67	132
Gasoil	1.31	130
Fuel Oil	1.9	115
Woody Biomass (loose)	0.57	79
Natural Gas	2.86	64
Coal	1.43	29.4

There is great interest in using biofuel (e.g. wood pellets) in cogeneration with coal. While this fossil fuel is cheap, related environmental problems are overwhelming. Mixing biomass pellets and coal could help to alleviate the environmental impact.

In certain countries, the tax structure favours the replacement of fossil fuels, in particular fuel oil and coal, by biomass, e.g. wood pellets. Sweden is prominent for such a tax advantages

COMPARISON OF WOOD PELLETS

Characteristics	"New ": 10 to 15 mm diameter	Conventional Pellet: 6 to 8 mm diameter	Chopped Woody Biomass
Humidity (%)	8 to 10	8 to 10	30 to 50
Cal.value(kcal/kg)	4,000 to 4,400	3,800 to 4,000	2,200 to 2,600
Ash Remainder (%)	0.5	0.5 to 2	10 to 20
Density (kg/cubic meter)	700 to 750	600 to 620	200 to 300
Energy use per kg of product (watt)	70 to 100	120 to 200 + **drying**	-
Production Cost (EUR/ton)	30 to 50	60 to 90	-
Wholesale Price (EUR/Ton)	80 - 85 (recycled material) 110 to120 (virgin material.)	100 to 120	40 to 60
Retail Price (E/kg)	-	0.25 to 0.27	0,08

The cost of fuel in a power station using low sulphur fuel oil with a caloric content of 8,000 kcal/kg is an average of 0.27 EUR/kg. For a biomass pellets with a caloric content of at least 4,000 kcal/kg, the comparable average cost is 0.135 EUR/kg or roughly the same on an equal caloric basis.

In certain countries, there are laws that give further advantages to the use of renewable energy, such as biomass pellets. (E.g. in Italy, the Bersani law grants "green certificates" for the use of the biofuel. Other countries also give comparable advantages to biofuels)

Pellets play a major role in the energy markets; in particular those derived from woody materials such as sawdust, wood branches, etc.

However, the conventional process has several shortcomings:

- It requires drying the raw material; a constant granule size; a final cooling phase, and high heat input of **400 to 500 Wh/kg** of pellets.
- Limitations in using many available biomasses.

The new process:

The new process is extremely versatile:

- Only limited energy consumption is required, as no drying or cooling is necessary.
- It can process biomasses of any origin.
- The patented process permits high productivity and high pellet quality.
- Humidity content of 40 to 50% in the starting material does not represent a problem.
- A variation of the process can treat humidity of up to 75 to 80% and thicken materials including sludge; industrial wastes (e.g. from the food and paper industries.) These volume reductions are accompanied by only **8 to 10% humidity.**
- It can process material with variable size granules.
- Product stability, homogeneity and density are guaranteed. This will help to avoid separation, sedimentation and compacting during storage and/or transport. It will avoid the creation of electrostatic charges that could result in combustion particularly in the presence of waste fuel and waste fuel mixtures with other components

The pelletizers are provided with matrices with holes for pellet formation located at the points of maximum pressure. The number and the diameter of these holes depend on the material to be processed and the expected pellet dimensions to be produced.

Only 50-100 Wh of energy consumption is needed for processing one kg of material with a humidity range of 15 to 40 %. This represents drastic production costs savings when compared to the conventional process. **This compares to 400 to 500 Wh per kg for the traditional method, a difference of up to tenfold!**

With this technology, pellets reach a bulk density of **700 to 750 kg per cubic meter,** or a density of **1.2 to 1.6.**

Personnel of limited experience can operate the pelletizer. The process is automated. It is controlled by microprocessors that will take into consideration the specific biomass processed. Process automation gives the pellets their uniformity. They also optimise temperature and limit energy input. Particular attention is paid to an optimum temperature for achieving high quality pellet formation.

The pelletizer is easy to install. Simple industrial flooring is adequate. Both the machine and its components are highly dependable. Maintenance of the machine is kept to a minimum.

Installed electric capacity depends on the volume of production and the material to be processed. Electric power requirements will vary with the raw material used from **100kW to 400 kW**.

. Each plant can be optimised for processing various kinds of materials, such as

- A specific biomass or agricultural and forest waste (e.g. any kind of woody biomass and/or hay biomass)
- Food industry by-products or waste
- Animal by-products or waste (e.g. poultry manure, animal litter, etc.)
- Wood industry by-products or waste (e.g. wood shavings, bark, sawdust, and scraps, etc.)
- Paper industry by-products or waste (wastepaper, pulp, sludge, etc.)
- Plastics related waste (e.g. packaging, fluff, plastic films, etc.)
- Waste water sludge from municipal origin and/or industrial processes
- Waste treatment (e.g. MSW that can also be converted into waste fuel)

End uses for this new and unique process are many:

- Production of pellets for energy generation from many existing biomasses. The resulting pellets have low humidity and high calorific value
- Volume and humidity reduction of various waste and sludge materials to enhance calorific value but also transportability.
- Improved logistics hence decrease the cost of loose material to be transported. A greatly reduced ("densified") volume achieves this. (E.g. more economic transportation to landfills.)

Additional examples for the potential use of the machine with a great variety of biomass materials, industrial and municipal waste and its application in a multitude of other sectors would represent a very long list.

Furthermore, the new technology is involved in the development of private and industrial heating systems that would take maximum advantage of these high quality biopellets.
These machines will initially vary in size from **2 to 4 tons per hour**.

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Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-3-Cariello-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Pelleting Presses for a Variety of Biomass Feedstocks

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Abstract

Amandus Kahl, celebrated the 125 anniversary in 2001. All over the world turn-key installation and machinery from Amandus Kahl are distributed in many industries like the animal feed industry and sugar industry.

Particularly in the field of thermal heat treatment of feed stocks and production technology of roughage Amandus Kahl has taken a leading position and their activities in new developments and research are internationally recognized. The unique flat die pelleting press has enormous advantages in the process technology of roughage such as straw or bagasse.

Bagasse pelleting has a long history in Amandus Kahl. Processes and pelleted bagasse can be used as combustible in the boiler of sugar factories, as raw product for furfurol production and treated with NaOH as compound feed components.

Amandus Kahl is well known for their know how and for the ability of their pelleting machines to process difficult roughage materials such as wheat straw, maize straw and of course bagasse. Wherever cereal grains or sugar cane is being cultivated a lot of roughage, such as straw or bagasse is generated. These by-products are often burnt or utilised to provide boiler energy but they can also be used as ruminant feed.

The increase in the world population is forcing industry to seek and to utilise all known available feedstuffs in order to meet the demand for dairy and meat products. Companies might also find that it pays them to utilise such relatively low value products in a more profitable way, as a ruminant feed components, rather than to simply burn them for their calorific energy values.

Before whole bagasse can be fed to cattle it is necessary to condition the product by breaking down the ligno-cellulose component, to such extent that the animal can use the product, in terms of its digestibility and to make it more readily available. i.e. in pelleted form.

Different chemical means of decomposition and technical processes have been used, such as NaOH, Urea and Ammonia. One process that has proven to be quite popular and most cost effective, is based on the addition of NaOH as a conditioning agent. It is characterized by:

- **Crushing and de-fibration** of the straw or bagasse, to render the material more accessible to the decomposition agent.
- **Conversion of the cellulose structure** from a crystalline state into an amorphous state by means of NaOH, together with heat, time, and pressure, in order to increase digestibility.
- **Compaction**, i.e. pelleting of the product in order to increase the bulk density of the straw or bagasse. This increases the animal's feed consumption and its performance.

One can also add UREA to increase the nitrogen content of the product and the production of bacterial protein, which in turn contributes to a general protein increase. This is particularly important for the feeding of dairy cattle.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-4-Schimmel-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Bagasse Pelleting – Application in the Sugar Cane Industry

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Abstract:

CPM (California Pellet Mill) is the world leading designer and manufacturer of pelleting equipment, offering a complete line of pellet mills, conditioning systems, coolers, crumblers, coaters, feed cleaning systems and pellet dies.

Roskamp / Champion designs and manufactures a broad range of particle size reduction machinery. The product line includes roller mills, hammer mills, shredders and crushers, and also flaking mills, oat hullers, steam chambers, rotary feeders. A Pellet mill compresses mealy or powdery materials into firm, uniformly shaped granules.

Pelleting minimizes problems of reclaiming or disposing of dust, powders, residues or other hard to handle materials.

- Reduces cost for shipping, storage and handling.
- Densifies waste materials.
- Converts combustible energy resources into more efficiently consumed, cleaner burning pelleted fuelBiomass applications of pelleting technology includes the feedstocks wood, sewage sludge, RDF, coal, sunflower hulls, bagasse, peat, meat and bone meal.

Advantages of bagasse pelleting comprise the following:

- Facilitating material handling and rate of flow control
- Economic storage and transportation
- Reducing dust explosion potential
- Efficient control of combustion

The pelletised product can be used as feed ingredient or as fuel for burning. Pellets with a diameter of 6-8 mm are used in household stoves and pellets with a diameter of 8-18 mm are used for industrial applications. The energy level of pellets amounts to 4.8 – 5 kWh/kg and thus the energy level of 2.4 kg bagasse pellets equals the energy level of 1 litre oil. The total energy consumption of the pelleting process is approximately 75 kWh per ton. Thereby, the energy consumption of the transport is 5 kWh/t, the grinding is 15 kWh/t, the pelleting is 50 kWh/t and the cooling is 2.5 kWh/t.

The following list presents reasons for the increasing importance of waste management and recycling:

- Increased prices for landfill.
- Increased energy/fuel prices.
- Increased taxes on fossil fuels.
- Increased prices for products made of recycled materials.
- Increased prices for new basic ingredients

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-5-vom Hofe-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Anaerobic Biogas Generation for Rural Energy Provision

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Abstract:

Biogas digesters (BGD's) take a renewable resource, animal and/or human manure, and convert it into biogas and liquid manure by means of the biological process termed anaerobic digestion. The biogas is comprised primarily of ~ 70% methane, and ~25% carbon dioxide.

BGD's have significant locally realised benefits, even more so when a flush toilet is connected to them. These include the generation of energy (both thermal and electrical), the production of liquid organic fertiliser, the elimination of diseases such as cholera, reduction in respiratory and eye ailments, reduction in deforestation and soil erosion, and reduction in menial labour time. Grey water recycling within the household ensures that water provision or its availability is not a limiting factor.

From the global environmental perspective, biogas technology reduces greenhouse gas emissions by displacing the consumption of fuel wood. Using data from a rural community outside of Durban, each household that makes the switch from fuel wood to biogas would avoid the emission of CO2 by as much as 4.9 tonnes/year. Extrapolating this information to the 300 000 households that could replace fuel wood with biogas, 1.5 million tonnes per year CO_2 emissions could be avoided. Current estimates of the value of these avoided emissions are in the region of US $10/tonne, or about R 150 million per year.

From a sustainable development perspective, biogas technology, while providing all the benefits outlined above, can also be utilised as a means to direct foreign investment towards the aims of the National Development Program, and the Integrated Development Planning process. It achieves these results independent of the fluctuations in the value of the South African Rand and by generating employment opportunities in local communities. Biogas technology should be increasingly seen as the favoured alternative to many of the South Africa's, and communities', development problems.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-6-Austin-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Co-generation in the Sugar Cane Industry

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Recent Co-generation Experience of PGBI Ltd

- Manage the installation Komati Mill Co-generation plant system (2x10MW sets).
- Install Hippo Valley co-generation 20MW set.
- Tariff negotiations for first- co-generation with National Utilities.
- Upgrade Malelane power station (Coal consumption reduction 650t/a to 180t/a).
- Various sugar factory energy efficiency improvement programmes.
- Technical papers on Co-generation World Energy Forum and SA Sugar Technologists Association.
- National study Co-generation of Electricity from Biomass for Government of Swaziland.
- Largest (and first of a kind) backpressure cogeneration turbine in Africa's sugar industry (20MW)
- Complete boiler plant overhaul to improve efficiency and reduce coal usage (from 105 tons per day to 0)

Recent Studies and Papers

- Feeding Bagasse to Multiple Boilers with a *"Smart-feed™"* Bagasse Fuel Conveyance and Distribution System, Incorporating "Renton Ploughs"
  Authors: Edward Kaliika, the late Robin Renton, Johan Groenewald and Garry Wenham
- The Engineering, Installation, Integration and Operation of a 20MW Co-generating Turbine Alternator at Hippo Valley Estates
  Authors:: Steve Ndoro, Johan Groenewald and Garry Wenham
- The Economic Potential of Ethanol and Cogeneration Projects in Africa
  Author: Peter Bailey

Feasibility Studies

- Evaluation of a national programme for the blending of ethanol derived from sugar cane as an octane enhancer on local blendstocks - Swaziland
- A study to evaluate the potential for co-generation of electric power with the Swazi Electricity Board's (SEB) network to reduce dependence on imported power. The study included recommendations on improving sugar mill energy efficiency to increase bagasse surpluses for this power generation. Client: Govt. of Swaziland / Ministry of Natural Resources and Energy (MNRE)

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TM-7a-Groenewald-LAMNET-WS-Durban)
(PDF-File: PPT-TM-7b-Groenewald-LAMNET-WS-Durban)

Tuesday Afternoon Session: Rural Energy – Woodfuels, Charcoal and Household Issues

Joint Workshop by CARENSA – SPARKNET - LAMNET

Rural Energy in Sub-Sahara Africa: Elements for a Debate

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I- Key facts

1- Importance of biomass to meeting basic domestic needs: mainly charcoal in urban areas and wood in rural areas: 75 % on average which contributes to environmental degradation.

2- The access to commercial energy sources is mainly limited to urban areas. The majority of the population in the sub region still relies on wood fuel (75% of the total energy consumed by the residential sector).

3- The installed regional production capacity exceeds 49,000 MW, and its regional peak demand was over 35,000 MW in 2000. The region's electricity consumption in that year was estimated at 215 TWh. Most of the generating capacity (about 85%) and electricity demand (about 83%) is located in South Africa, the largest energy market in the region.

4- Most of the regional coal reserves are located in South Africa, accounting for as much as 90% of the regional reserves estimated at about 58 billion tones. Other countries with major coal reserves include Botswana, Mozambique, Swaziland, Zimbabwe and Tanzania. Coal is mainly exported, used for power generation as feedstock in the South African synthetic fuels industry and for general industrial applications.

5- The Region has massive hydropower resources, with an identified potential of 100,000 MW in Congo (DRC) alone, of which about 50,000 MW is at the Inga site. Other countries with major hydropower resources include Angola, Mozambique, Tanzania and Zambia.

6- The Region has diverse commercial energy resources and significant reserves of coal, petroleum and natural gas. Electricity is generated through thermal and hydroelectric resources and one nuclear facility is available in South Africa. Natural gas is becoming more significant to the SADC Energy Sector as large fields off Mozambique, South Africa and Namibia are developed.

II- Constraints to rural energy development

- Poverty: low purchasing power
- Population: low density
- Infrastructure: energy infrastructure poorly developed: grid, LPG, filling plants,

III- Issues and policy Guidelines

- Decentralised energy supply versus centralised approach:
- Role of private sector: Financial schemes for private energy providers : in place in production e and distribution of modern energy in rural areas.
- Financial schemes for the rural communities: connection and down payment for the up-front capital
- Role of government: facilitation and regulatory interventions in the form of policies and acts.

IV-Priorities

Little impact of rural electrification programmes in the past . This means a change in the strategy.

Prioritsing income generating activities in rural areas. Income generating activities increase the demand of modern energy in rural areas hence create a base upon which modern energy especially electricity can be extended to households.

Fossil fuels and rural energy: role of natural gas

The coming on stream of all the planned natural gas development projects would lead to considerable growth in the natural gas industry in Southern Africa.

Communities living closer to the gas projects need to be taken into consideration.

Natural gas projects should not only focus on industry and commerce, but also on supplying communities along the pipeline routes. This would minimize their dependence on fuel wood and other polluting fossil fuels.

The use of gas for the promotion of small and medium industries along the pipelines must be part of the development and utilization of natural gas in the region.

PV has a niche but is still too expensive for poor people

Ex Botswana Government has in place the National PV credit scheme that requires a down-payment of 15% with the rest paid in 4 years at an interest rate equal to the prime rate, the payment conditions are still too high for potential customers and the rapid dissemination has not been attained.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TA-1-Khennas-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Rural Energy in Zimbabwe – Focus on Biomass

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Zimbabwean Profile

•Area	390 580 km2	•Average Size	4.7
•Population	12.3 million	•Grid Electricity	7 % Rural
•Growth Rate	0%	•Exchange Rate	1US$=Z$55
•Average Density	27 persons/km2	•HDI (1997)	75% Rural Poor
•No. of Households	2, 510, 410	•Annual Deforestation	25%

Rural Energy

- Position of Biomass (Wood, Charcoal, Biogas)
- Electrification "Rural Electrification Bill"
- Other Sources of Energy
- Small Industries

Energy Consumption

- Wood Use – 6million m3 (–7% Wood Use in Region, –2% of National consumption)
- Free Commodity; Per Capita Consumption – 2.7 kg/day
- Appliances

Energy Policy

- Adequacy of Policy
- Legislature
- Role of NGOs

Discussion

- Future of Biomass Energy Scenario
- Stove Programs
- R&D
- Information Dissemination & Lobbying

Rapporteurs Note:

The issue of rural energy supplies in Zimbabwe is very appalling in current times. Politics have had major influence on the poor state of economy and energy availability in Zimbabwe. As a result, poor people continue to irrationally exploit traditional biomass energy systems that are characteristic in poor communities. The process has led to greater loss in natural forests and biodiversity.

Household air pollution is certainly high in rural communities where traditional biomass energy sources are used Zimbabwe. Household air pollution has caused poor health to many people, particularly children and the elderly.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TA-2-Lasten-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Assistance to Rural Communities for Access to Improved Energy Services

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Abstract:

Women and children are the main fuel users within households and often bear responsibility for fuel wood collection. Consequently, adverse effects of poor access to energy services such as the drudgery and risks of fuel wood collection as well as exposure to indoor air pollution affect women and children more than men. Thus improved energy services are particularly important for the upliftment of the status of women and rural development in general. By improved energy services we mean improved accessibility of energy (the fuel) plus the complementary conversion appliances. Availability and affordability of energy services are equally important issues for household health, safety, nutrition and livelihoods.

Energy service delivery in rural areas lags behind that of urban areas, but is currently receiving attention from the government and private sector, while local communities are being drawn in to participate in finding solutions. In South Africa, for example, the government is supporting the extension of grid electricity services, and in areas where this is considered too costly, concessionaires have been appointed to provide basic electrical services through the use of photovoltaic solar home systems (SHS). Five concessionaires have been appointed to provide about 50 000 SHS each in selected regions at a subsidy of about R3500 (approximately 334.60 USD) per installed system.

In addition to SHS, both the government and the concessionaires are helping to improve access to thermal energy services. For example, the government is piloting the concept of “Integrated Energy Centres”(IECs). The main aim of the IECs is to deliver comprehensive energy services to rural communities and to reduce the price of paraffin and liquefied petroleum gas through bulk distribution and/or shortening of the distribution chain. Information dissemination to improve energy awareness will also be done through the IECs. Similarly some of the concessionaires will open up energy stores which will be operated and run using a utility model. Lessons learned from both approaches (utility operated energy stores & government-community owned & operated IECs) will be very useful for the improvement of service delivery in rural areas hence it is important for these models not to be seen as competing.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TA-3-Qase-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

Reliance of traditional rural livelihoods in KwaZulu-Natal on biomass resources

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Abstract

Most traditional rural households in KwaZulu-Natal use fuel wood for boiling water, cooking food and generating warmth. This presentation will provide a synopsis of the findings of research carried out in fourteen communities located in different parts of the province.

The research involved using structured questionnaires to interview householders and key stakeholders, and a range of participatory rural appraisal techniques to acquire information during group meetings with the communities. Data on the frequency and amounts used, and amounts traded of twenty three different categories of natural resource products enabled the value of the resource as a source of energy, food, fodder, medicine, building material, utensils and income, to be calculated. Information on the species used for different purposes, the perception of their availability, and factors that may have influenced this over the past decade, was also obtained.

An attempt was also made to assess the awareness of and willingness to pay for the ecological and social services of natural vegetation, as well as to elicit opinions regarding it's conservation. The presentation will attempt to explore the decision making trade-offs involved in converting natural vegetation to small-scale cash crop farms.

Rapporteurs Note:

Description of methodology

To assess the reliance of traditional rural communities on biomass energy, 14 different communities were used. Structured questionnaires were used to gather information from the communities. The heads of households, assisted by members and relevant traders completed the questionnaires. Some information on biomass resource use as fuel was also gathered from group discussions.

The type of questions asked mainly focused on the impact of traditional biomass energy on vegetation biodiversity. To assess and evaluate the benefits of biomass harvesting in traditional communities, socio-economic benefits from the biomass resource harvesting were quantified in financial values. Although the communities surveyed made about R800.00 per annum in Kwa-Zulu Natal (KZN), the financial benefits were consistently much lower than in other areas of the country.

There are few households in Kwa-Zulu Natal that use charcoal for household energy, however, there is a widespread use of coal in the northern part of Kwa-Zulu natal. It is also not uncommon that gas can be a common source of energy in KZN, despite that some of the communities clearly have the capacity to pay for electricity.

When comparing the abundance of plant species in the area, it is evident that plant species most preferred for fuel wood have continued to decrease over the years, and will do so way into the future. There are various reasons for the decrease, which, of course may include the following:

- irrational harvesting practices,
- illegal harvesting in protected farms, where irrational practices are also applied,
- the increase in homestead numbers together with the need for arable farming,

In more recent years, people have started reforestation for economic purposes in small areas. After harvesting, the woods are sold to SAPPI for better profits. The practice has major negative impact on the biodiversity in the affected communities.

To clearly understand the impact of natural resource harvesting and exotic wood development, it is necessary to determine the diverse values of natural resources in communities prior to their disturbance. Quantification of the resource values shall help to determine rational processes of resource harvesting and management. Furthermore, it shall help protect susceptible or endangered natural resources for their long-term socio-economic viability.

In conclusion, the fact that most households in Kwa-Zulu Natal use fuel wood as a source of energy creates greater pressure on the natural resource. Exotic woods cannot alone address the socio-economic problems of the area, as they more often displace other valuable natural resources. It is essential to assess and evaluate the socio-economic potential of all resources prior to the introduction of exotic woods or other mono-investment practices.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TA-4-Watson-LAMNET-WS-Durban)

Joint Workshop by CARENSA – SPARKNET - LAMNET

TRADITIONAL HOUSEHOLD ENERGY SECTOR IN SAHELIAN COUNTRIES OF WEST AFRICA

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Abstract:

Burkina Faso, Cape Verde, Chad, Gambia, Guinea Bissau, Mali, Mauritania, Niger and Senegal constitute the nine Sahelian countries belonging to the CILSS (Permanent Inter – State Committee for drought control in the Sahel). The contexts of this part of sub-sahelian Africa formed by the nine States members of CILSS, are characterized by:

- the desert with a potential woody biomass hopeless accounts 50 per cent of the region surface and is in clear progression;
- a galloping demography and a rapid urban growth rate;
- weakly industrialized, agriculture and service remain the key sector of sahelian economy. Agriculture, principal occupation of people in Sahel is dependent on the natural condition. Sahelian economy is sensible to the fluctuations of the courses (devaluation, variation of the dollar, price of the baril), owing to their dependence of the outside.

Sahelian countries rely almost entirely on traditional energy and imported petroleum products to meet their energy requirements. Traditional energy constituted by woody biomass and agro-forest residues is the main energy source. The consumption of modern energy formed by oil and electricity is relatively weak. In spite of the growth of the demand in electricity and petroleum products that seem to follow the evolution of the demographic growth, it is noted the traditional energy preponderance. However the part of the budget devoted to the modern energy is extensively superior to the one of the traditional energy.

Also Sahelian countries are characterized by a negligible new and renewable energy part in the energizing balances in spite of the real potentialities that they represent

The main consumer of energy, in the Sahel is the domestic sector followed by order of importance of the transportation and the industry. This preponderance of the domestic sector in the final energy consumption shows the particular attention that one grants to it in the energizing policies and in the processes of development. Its importance also justifies the interest that there is to have a better knowledge of its distribution of it, these conditions and its different fashions of use by the households.
The cooking of foods remains the main use of the energy in the sahelian households. The traditional energy, gas and the kerosene constitute the only domestic fuels to meet the energy need for cooking. The weight of these fuels in the energizing balance of the households is or even to the origin of the synonymy between " household energy " ; “traditional energy "; “ traditional fuel” and " wood fuel” in view of the importance of this last in the range of the energies. In fact, kerosene and bottled gas(LPG) are used by only a very small part of sahelian population owing to their cost and the investment required.

The increasing demand in woods energy bound to a galloping demography constitutes a factor of aggravation of the forest deforestation with everything that it includes like consequences. So as the availabilities in dendro-thermal shrink, the acquirement of the woody fuels becomes a more and more laborious physical and economic burden for the sahelian households. It also is important to note that the most important features of the Sahel are the vulnerability of the wood resources and the risk involved in exploiting them because of soil fragility and climatic fluctuations.

Fossil fuels and, in particular, oil (kerosene and LPG) which might have been able to replace wood to a certain extent have become so expensive. Moreover, they represent a heavy burden on the sahelian countries which must import all such fuel, and an increase in their consumption cannot be encouraged. For both economic and social reasons, the only available energy source for the rural, and part of the urban, populations is organic material, especially woody biomass.

The correct use of improved cooking stove constitutes the most economic solution for the sahelian households. It is evident from the previous analyses that the introduction of the improved cooking stove in the sahelian urban zones, must constitute an axis privileged in the strategies energy servants. The existence of facilities adapted to the context of countries is a major asset in the setting up of regional strategies of metallic improved stove in direction of the cities.

Additional information *is provided in the Power Point Presentation Viewgraphs.*
(PDF-File: PPT-TA-5-Fall-LAMNET-WS-Durban)

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CONCLUDING ROUNDTABLE DISCUSSION

Remarks

- Biomass resources have different uses and socio-economic values, which must be optimally appreciated and developed for effective rural development.
- Although Africa cannot soon catch up with the industrialized world, it is important to make use of the available natural resources in the most profitable way, so that the people of Africa can experience sustainable development.
- Considering the complex and more serious situation of bioenergy in rural communities, it is necessary to optimise the exploitation of sugar cane as an important source of bioenergy for the development of the rural communities. The process can certainly alleviate the pressure on the already degraded natural forests.
- Although natural forests have the ability to resist external pressure systems, it is imperative that natural forests are not exploited to the critical threshold, as they shall fail to recover thereafter.

Conclusions

(a) biomass use in Africa displays a multidimensional non-sustainability, compelling for the need to identify immediate solutions to all limitations,

(b) the level of analysis must include local, regional, and international aspects and processes that can be used to close the gaps between the poor and the rich, while focusing on global equity;

(c) at national levels, governments must be fully committed to the development process of bioenergy, while allowing greater participation of the affected communities: the process can promote rural energy sustainability,

(d) technology must consider the integrated needs of the people – greater technological efficiency must be promoted and shared between north and south,

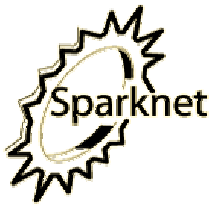
(e) increased production efficiency in rural communities must be developed and promoted by the private sector in partnership with government and the communities,

(f) the information gathered from this workshop must be shared with politicians, as well as decision-makers for successful implementation,

(g) a position paper summarising the results of this workshop will be introduced and distributed at the World Summit for Sustainable Development in Johannesburg,

(h) there is an urgent need to collect and develop quality data by the three networks CARENSA, SPARKNET and LAMNET, which can be distributed through the project websites,

(i) accumulating evidence clearly supports the need to proactively and vigorously develop sugar cane based bioenergy applications, which can contribute to sustainable socio-economic development in the region.



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