

Training Workshop on Clean Energy: Promotion of alternative energy, and energy saving technologies

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Gombe Masito Ugalla Program

Workshop held on 30th to 31st October 2013

JGI Conference Hall, Kigoma



CONSERVATION INTERNATIONAL



the Jane Goodall Institute



WORLD RESOURCES INSTITUTE



AFRICA BIODIVERSITY COLLABORATIVE GROUP

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Training Workshop on Clean Energy: Promotion of alternative energy, and energy saving technologies



the Jane Goodall Institute

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Acronyms

ARTI	Appropriate Rural Technology Institute
CO2	Carbon Dioxide
JGI	the Jane Goodall Institute
GGE	Greater Gombe Ecosystem
GMU	Gombe - Masito - Ugalla Program
GVEP	Global Village Energy Partnership
PV	Photo Voltaic
SACCOS	Savings And Credit Co-operative Society
TACARE	Lake Tanganyika Catchment Reforestation and Education
TaTEDO	Tanzania Traditional Energy Development Organisation

Summary

The The Jane Goodall Institute through Gombe - Masito - Ugalla program initiated a pilot project to develop ways of arresting the rapid degradation of natural resources, especially the remaining indigenous forest around the Gombe National Park and along the shoreline of Lake Tanganyika in the Kigoma district. The area is widely deforested due to clear-cutting for cultivation purposes, the use of firewood for domestic and fish processing purposes, and additional pressure on natural resources caused by the influx of refugees from the Democratic Republic of Congo and Burundi.

In collaboration with GVEP, a review of household clean energy utilization for Lighting Charging and cooking in East Africa and specifically in Kigoma and Arusha regions in Tanzania was conducted. Findings from this review, and other experiences in clean utilization were worth to be shared. Therefore, *Training Workshop on Clean Energy* was organized to realize the following objectives;

- Share assessment findings on clean energy options in Kigoma.
- Facilitate experience and technology sharing.
- Link clean energy technology entrepreneurs with financial institutions and encourage investment in clean energy technologies.

Participants for this workshop include; Large energy consumer, Financial institutions, Business stakeholders, Environmental conservation organizations, District and municipal councils representatives. In addition, selected facilitators from various institutions which promote the use of clean energy also participated into the workshop. These facilitators represented the following institutions; University of Dar es Salaam, GVEP, ARTI Energy, Solar Africa Oven Society, TaTEDO and SEDC. The workshop attracted a total of 47 participants.

During the workshop that was extended in two days, 9 presentations were made. Also, 7 clean energy experiences covering micro-financing, business and utilization were also shared. The presentations include descriptions of clean energy theme, demonstration of applications and exemplary local experiences of clean energy utilization as well as show cases of appropriateness for adoption of clean energy technologies. Meanwhile, experiences shared during the workshop indicated on the available financing schemes, typical performance of clean energy businesses and services as well as energy savings achieved through efficient energy utilization.

Group discussions were done on 5 issues targeting promotion of adoption and widespread utilization of clean energy. Recommendations which came from the group discussions and hence accepted by participants as workshop recommendations were as follows;

- Use of efficient charcoal kiln and improve charcoal stoves should promoted.
- Alternative energy sources should be used in order to reduce the rate of deforestation.
- Training on clean energy technology, utilization and local manufacturing are important.

- Subsidy is required for wide utilization and affordability of clean energy technologies.

*Dr. Joseph Kihedu
University of Dar es Salaam
14th November 2013*

1.

Introduction of the Jane Goodall Institute and the Clean Energy Workshop

*Presenter: Mrs. Mary Mavanza
Governance Officer, GMU program*

Institution: the Jane Goodall Institute



BACKGROUND

Introduction

In 1994 the Jane Goodall Institute initiated the TACARE project designed as a pilot project to develop ways of arresting the rapid degradation of natural resources, especially the remaining indigenous forest around the Gombe National Park and along the shoreline of Lake Tanganyika in the Kigoma district. The area is widely deforested due to clear-cutting for cultivation purposes, the use of firewood for domestic and fish processing purposes, and additional pressure on natural resources caused by the influx of refugees from the Democratic Republic of Congo and Burundi. The subsequent reviews and evaluations of the TACARE project has indicated the need for an intensive and landscape scale conservation approach thus leading to the establishment of the Greater Gombe Ecosystem (GGE) and Masito Ugalla programs in early 2005 and then the current Gombe - Masito - Ugalla (GMU) program.

JGI hypothesizes that, if;

- i) The community knowledge, awareness and attitudes towards environment and great apes changes positively, and
- ii) Government and community capacity for improved management of natural resources enhanced, and
- iii) Access to and utilization of micro credit, socio-economic services and technologies increases

Then,

- i) Socio-economic status of the community will improve, and
- ii) Threat for great apes and their habitats will decrease.

Promoting Energy serving and Clean energy

One of the major drivers of deforestation identified in Kigoma includes use of fuel wood as the main source of fuel at domestic and at times industrial level. It is seemingly impossible to achieve conservation and climate change goals with the current rate of deforestation resulting from fuel wood demand. To some extent people are not exposed to other options than traditional technologies. In Kigoma and elsewhere in Tanzania a number of technologies have been introduced to efficiently use fuel wood and even shift to using different technologies like Cooking Gas biogas etc. the rate of adoption is however still very low. It is therefore important for government and private sector to participate in efforts to reduce deforestation rate.

The Jane Goodall Institute in collaboration with GVEP conducted a review of household clean energy for Lighting Charging and cooking in East Africa and for Tanzania Kigoma and Arusha regions were included in the review. Findings of this review are worth sharing as a stimulant for clean energy fostering, and hence contribute direct to the following workshop objectives.

- Share assessment findings on clean energy options in Kigoma.
- Facilitate experience and technology sharing.
- Link clean energy technology entrepreneurs with financial institutions and encourage investment in clean energy technologies.

Participants of the workshop include; Fuel wood main users, Financial institutions, Business stakeholders, Environmental conservation organizations, District and municipal councils representatives

2.

Overview of Clean Energy

Presenter: Dr. Joseph Kihedu

Institution: University of Dar es Salaam



INTRODUCTION

Clean energy is energy that can be extracted, generated, and/or consumed without any significant negative impact to the environment i.e. carbon-neutral fuels and energy sources. Clean energy include sustainable energy and renewable energy. Sustainable Energy is the energy which meets the current needs without compromising the future. Renewable energy is the energy which is focusing on the ability of an energy source to continue providing energy. Renewable energy sources are abundant and decentralized than conventional energy. In addition, the environmental impacts and the growing concerns over diminishing fossil fuels reserves indicate how important the renewable energy is.

Efficient energy utilization can also be considered as important part in environment conservation efforts. Although energy efficiency can also be achieved even when non-renewable energy is utilized, the scale of the environmental degradation per unit of energy consumed will significantly be lowered.

Natural gas also produces about 30% to 40% less CO₂ compared to petroleum products and coal per unit of energy consumed. Also low gaseous pollutants are produced when natural gas is utilized.

BIOMASS ENERGY

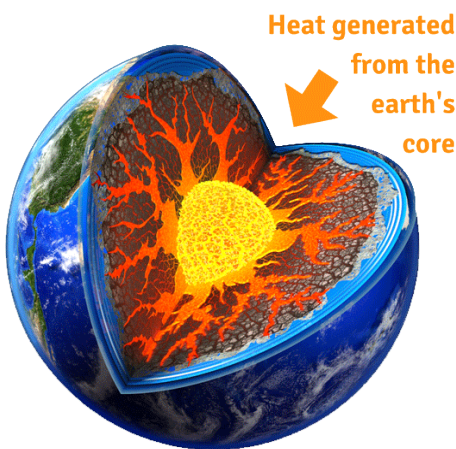
Biomass energy is derived from organic matter. Stoves that burn wood are the classic example of biomass utilization. There has been a 20-25% increase in the use of wood stoves over the past several decades. There are example of Biomass like Charcoal, briquettes and Ethanol Fuel. Charcoal is produced from biomass through pyrolysis (heating under limited supply of air/oxygen). Biomass briquettes can be made from fresh biomass, wastes or from char dust. Ethanol fuel is a biofuel alternative to gasoline, which is gaining popularity world-wide, Car engines can be designed to run on

10%, 50% even 100% pure ethanol. Ethanol fuel it is cleaner burning than gasoline and the use of ethanol is rapidly increasing. Brazil is the world leader in ethanol fuels.

OTHER FORMS OF RENEWABLE ENRGY

Solar photovoltaic use solar modules to convert sunlight into electricity like solar home systems and Solar battery chargers. Hydropower represents the power derived from the energy of falling water and running water. Geothermal power originates from formation of the planet and Radioactive decay of minerals, accounting for 20% and 80%, respectively. Wind energy has been utilized for thousands of years. The wind is free, commonly available and can provide clean, pollution-free energy. In most cases, the cost of commercial wind power on a large scale is not economically competitive with conventionally generated electricity with a doubling of wind speed, power output increases by a factor of 8. Wind blowing into a turbine turns the blades of the rotor, which rotate machinery inside a compartment (nacelle), Towers are 40 - 100 m (131 - 328 ft.) tall. Higher altitude is better to minimize turbulence and maximize wind speed.

In order to harness the tidal energy, turbines can be place on the ocean floor, e.g. at the entrance of a bay, the flowing water can turn the fan to generate electricity .Another option is to use under water turbines, which is like an underwater wind farm. Wind driven waves can be harnessed by using many technologies, however only few of them are adequately tested some involve floating devices that move up and down the waves. Wave energy is greater at deep sea, transmission to shore is expensive, waves can be directed into a channels and elevated reservoirs; electricity is generated when water flows out. Other designs use rising and falling waves to push air in and out of chambers, turning turbines to generate electricity. Ocean energy thermal conversion (OTEC) technologies exploits the temperature difference between warm surface water and the cold water at depth to run a “heat engine”. A heat engine is a device placed between a high temperature reservoir and a low temperature reservoir that produces energy. The temperature difference must be at least 22 C year round, which is only found near the equator.



Geothermal energy potential [left] Turbines for tidal energy conversion [right]

ENERGY SITUATION IN TANZANIA

Energy consumption in rural areas accounts for 85% of total national consumption, Energy balance is dominated by biomass-based fuels accounts for more than 90% of primary energy. Commercial energy sources i.e., petroleum and electricity accounts for 8% and 1.5% resp. of the primary energy used. An installed Capacity stands at (1006 MW) of which hydropower comprise 561 MW and thermal 445 MW. Co-generation (Sugar & Wood Processing Plants) accounts for 35.8 MW. Over 55% of installed capacity of grid connected at Kidatu, Hale, and Nyumba ya Mungu etc. Despite of availability of natural gas, hydropower play will continue to play a major role. Also Wind Energy Mainly used for water pumping and Electricity generation - rarely in small scale. Solar Energy from Solar PV used in home system, solar lanterns and solar water pumping, also solar heating for drying of agro-products and water heaters. Biogas and Bio-oil, more than 4,000 domestic-size biogas plants have been in Tanzania during the past 20 years like Katani Biogas plant in Tanga (300 KW to increase to more than 1MW). Lots of pilot schemes with land allocation to interested investors accelerating jatropha plantation. Important option as agriculture and agro-industries account for close to 70% and over 70% of employment. Sugar industries produce steam for sugar processing but also generating electricity. Kilombero sugar and Kagera sugar could be replicated across agro-industries like wood/timber, pulp and paper, coffee, sisal, palm oil, tea and tobacco.

3.

Household Energy Utilization at Mpanda and Nsimbo Districts

Presenter: **Mr. Demitius Kamtoni**
Institution: **Mpanda/Nsimbo District Councils**

BACKGROUND

Tanzania has total area of 94.5 million hectares, out of them 88.6 million hectares are land area and 5.9 million hectares are the waters, i.e. ocean and the lakes. Forest reserves and land for general use covers 35.3 million hectares (FAO, 2010). The rate of deforestation is about 300,000 per year which is equivalent to its 0.3% of its total area per year (World Bank 1992).

HOUSEHOLD ENERGY UTILIZATION

In Mpanda and Nsimbo districts, household energy utilization is mainly consumed for cooking and lighting purposes. For cooking energy, 95% of the households utilize wood fuel while charcoal is utilized by 90% of the households. Households which use kerosene and solar PV systems for lighting are 98% and 3%, respectively. It can be noted that wood fuel demand for Mpanda District is 500 m³ and charcoal demand is about 8,000 m³ (DLNR-MPANDA, 2013). Country wide charcoal demand is estimated at 87,000,000 m³. Considering the above indicated forest resources in Tanzania, sustainable charcoal production is about 65,000,000 m³ (NAFORMA, 2012).



Traditional cooking stove and kerosene lamp [left]; Charcoal bags [right]

4.

Findings From a Review of Clean Energy Technologies

Presenter: Mr. Faustine Msangira

Institution: GVEP



Introduction to GVEP

GVEP was established in 2002 at the World Summit for Sustainable development in Johannesburg with the aim of accelerating access to modern energy. In 2006 GVEP became a registered charity which was active in 19 countries within Africa, Latin America and the Caribbean.



Firewood collection [left]; three stones cooking stove [right]

PROJECTS IN TANZANIA

DEEP

DEEP was a 5 year project funded by EU. The project assisted the identification of viable energy enterprises, market opportunities, technology options, and service structures to generate revenue and sustain business. DEEP also assisted entrepreneurs to develop business plans and access finance. In DEEP around 1,000 micro-entrepreneurs are being supported with more than 1.7 million beneficiaries

CARE2

Under CARE2 there are GVEP International projects and Pipeline Development Projects. GVEP International is implementing a major Sida funded project called Capital Access for Renewable Energy Enterprises (CARE²) in Kenya, Uganda, Tanzania and Rwanda. Pipeline Development Projects, (PDPs), targeted market development activity, in specifically defined niches, designed to stimulate the creation and growth of e-MSMEs in those niches, and thereby to build the “pipeline” of potential transactions for investors/ lenders.

Tanzania PDP

One of the PDPs is in Lake Zone which aims at developing a network of micro phone charging businesses and other types of business using small scale solar PV in rural areas of Lake Zone. In PDPs a total of 550 entrepreneurs are in the process of being recruited and trained to establish phone charging businesses and other types of business using small scale solar PV in rural off-grid areas, this project is known in short as PDP2.

Tanzania Project Purpose and Activities

Household energy is a crucial issue for organizations who are working to conserve local environments that are coming under pressure from increasing human populations and activity. Recruitment, Trainings, Mentoring, Financial linkage, Market Development Activities as well as M & E Activities.

Methodology of the Study and Main Outputs

The study was conducted through a Desk review, Stakeholder interviews, Two site surveys and Shared team experience. Main outputs are Learning Report and a Toolkit.

Available Energy Technologies

Improved Cook stoves

Many different types of cook stoves exist like local artisan, factory made and imported which can vary from \$4 to \$80 for domestic type, often made as different components with middlemen and retailers involved. Challenges are lack of awareness, lack of quality control and high distribution costs

2. Solar

Lighting, television, phone charging, water pumping and productive use solar power. Products are imported and locally distributed. Challenges include the perceived high cost, cheap products in the market, improper use/ sizing and the last mile distribution.

3. Briquettes

Fuel made from compacted charcoal dust and other agricultural waste made from charcoal dust. Varies shapes & sizes depending on the production method and market and produced by small scale. Challenges were lack of awareness, competition with charcoal and production bottlenecks

4. Wind

Wind energy can generate electricity and mechanical power and acquisition of energy depend on site specific conditions. Most systems are imported. Challenges are very site specific nature of the wind resource in addition to requirement of back up system.

5. Biogas

Biogas produced by breakdown of organic waste. Most common type of biogas is dome biogas which cost from \$500 to several thousand national domestic biogas programs. Challenges include specific market niche, quality control/maintenance issues and high upfront costs.

Financing Options

Energy financing is still new, most FI don't have specific energy portfolios in which interest rates and requirements can be prohibitive. Flow of credit combined with capacity building and awareness, consumer can pay in three different options like upfront payment, payment through installments and pay as you go schemes (solar).

Challenges for energy initiatives are;

- i. Lack of available financing for consumers and entrepreneurs
- ii. Poor quality products have left consumer disappointed
- iii. Lack of local capacity for product suppliers

- iv. Ensuring sustainability of approaches
- v. Last mile distribution
- vi. Household don't priorities energy products



Demonstration of lantern [left]; Tree nursery [right].

Successes and Lessons Learnt

- a) Get the economics right
- b) Strong local presence keep momentum going
- c) Support from government policy helps
- d) Tapping into existing distribution channels can reduce costs
- e) Identify and understand your market segment
- f) Show consumer tangible economic and social benefits
- g) Peer marketing can have a strong effect
- h) Expect seasonal variations
- i) Cultural and social factors have a strong influence
- j) Local availability of products, materials and skills can increase sustainability

Recommendations

1. Work with existing energy businesses to extend product range or reach
2. Identify opportunities to develop new energy enterprises within the community
3. Further promotion and awareness creation of energy technologies with local households and institutions
4. Explore specific financing options for energy technologies working with financial institutions and local SACCOs
5. Promotion of woodlots and sustainable charcoal production techniques

6. Learn from existing projects and businesses
7. Leverage organizations with strong community links and those that are developing similar projects

8.

Clean Energy Options for Western Tanzania; Experience of TaTEDO

Presenter: Ms. Lilian P. Njuu

Institution: TaTEDO



ENERGY SITUATION IN TANZANIA

Tanzania is endowed with diverse energy resources of different forms such as biomass, natural gas, hydro, coal, geothermal, solar and wind, uranium, much of which are untapped. More than 85% of Tanzanian people are cooking by wood fuel (charcoal, firewood and residues), 14% of total population use electricity in which 2.5% of rural population for lighting while the rest are using firewood and kerosene. Also wood fuel, solar, electricity are used for agro-processing. More than 90 percent of energy for lighting is through wick lantern using kerosene since 98 percent of the rural population has no access to electricity.



Fire wood collection [left]; Traditional three stone cook stove [right]

ABOUT TATEDO

TaTEDO is a sustainable energy development organization based in Dar es salaam, Tanzania with activities in more than ten regions, 30 districts and 70 villages in Tanzania. The organization has more than twenty years' experience actively involved in sustainable energy development projects and programmes in rural areas. TaTEDO is committed to Enabling the Rural Majority in Tanzania to Access Sustainable Energy Technologies and Services

Our vision is to be the leading social enterprise organization facilitating majority access to sustainable energy technologies and services.

The mission is to facilitate increased access to sustainable energy technologies and services in Tanzania, while enhancing financial sustainability in partnerships with communities, entrepreneurs, and other stakeholders for environmental conservation and poverty reduction.

Goals

- i. Improve quality of life of women and men in Tanzania by contributing to availability of improved and sustainable energy services, employment and income generating opportunities, which are essential for poverty reduction,
- ii. Reduce environmental degradation resulting from increased use of wood and fossil fuels,
- iii. Assist the country to reduce dependence on imported energy.
- iv. Enable majority of the population, particularly women in rural areas to access sustainable modern energy technologies and services that contribute to poverty reduction, sustainable development and climate change mitigation and adaptation.

Objectives and Activities

To enable majority of the population, particularly women in rural areas to access sustainable energy technologies and services that contribute to poverty reduction, sustainable development and climate change mitigation and adaptation.

Some of our activities are;

- a. Promote the use of sustainable energy for productive uses (industrial, agriculture and basic infrastructure), consumptive uses (households and communities) and institutional uses (education, health, water etc.).
- b. Implement sustainable energy programmes and projects at the local levels.
- c. Provide energy related consultancy services.
- d. Develop networking and partnership with local and international organizations,
- e. Manage and disseminate energy information to stakeholders.
- f. Conduct lobbying and advocacy to influence energy related policies, legislations and strategies
- g. Support sustainable energy enterprises.

h. Conduct energy related applied researches.



Solar drier [left]; Institutional stove [right]

Challenges of Low Access to Modern Energy Services in Rural Areas

- i. Trap the rural people in poverty
- ii. Burden to rural population especially women and children.
- iii. Damages the environment i.e. deforestation.
- iv. Denies rural people access to modern technologies and appliances such as TV, computer, refrigerator, mobile phones etc.
- v. Denies rural people quality social services i.e. water, health and education.
- vi. Increased unemployment in rural areas forces youth to migrate to towns leading to overcrowding and crimes.
- vii. More than 40% of agricultural products are wasted due to post harvest losses and lack of appropriate energy to process or preserve them.

Renewable Energy Sub-sector in Tanzania

Recently, renewable energy sub-sector in Tanzania has moderately grown with different types of energy technologies and different actors. Renewable energy in Tanzania has mainly been implemented by small companies, donor and NGO projects for households, SMES and institutions. The driver behind this RE sub-sector growth are major power crises, the gap of modern energy services, rural and urban, increased awareness, capacity building, economic reforms, etc. Renewable energy technologies are financially and economically viable options for off-grid electrification and rural energy provision in Tanzania.

Why do people prefer renewable /clean energy?

- i. Site Access; Some well-designed RE system will operate unattended and requires minimum periodic maintenance.

- ii. Modularity; Some RE system can be designed for easy expansion. If the energy demand might increase in future years, the ease and cost of increasing the energy supply should be considered.
- iii. Fuel Supply; Supplying conventional fuel to the site and storing it can be much more expensive than the fuel itself. Energy from some RE systems is delivered free.
- iv. Environment; Some RE systems create no pollution, other have reduced pollutions and generate no waste products.
- v. Maintenance; Any energy system requires maintenance but experience shows some RE systems such as PV systems require less maintenance than other alternatives.
- vi. Durability; Most RE systems available today are based on proven technology that has shown little degradation in over 15 years of operation.

Clean Energy Development (Experience of TaTEDO)

TaTEDO has been working with different partners, since early 1990s in the efforts to enable the majority to access renewable energy services in two energy carriers and related technologies; solid biofuels and electricity;

- i. On solid biofuels, efforts have been on efficient cook stoves and charcoal production. More than 1 mill. Stoves have been disseminated with support of TaTEDO and more than 1500 technicians trained.
- ii. On electricity efforts have been on promoting stand alone and mini grid based renewable energy technologies. More than 800 tech. trained and several thousand systems sold and installed.
- iii. Major focus of TaTEDO has been to build capacity for assessment, designing, installation, maintenance of technologies, businesses and markets through CSOs, LGA and entrepreneurs.



Improves cook stove



Demonstration for charcoal kiln

Contribution of TaTEDO to sustainable development and poverty reduction

- a. TaTEDO has promoted renewable energy services for productive and consumptive uses in more than 165 villages,
- b. It has facilitated provision of RE energy services to more than 1900 SMEs and institutions e.g. Sahara Stove Group which is producing 15,000 stoves per month
- c. TaTEDO has created employment to more than 4,000 artisans, technicians, baking groups and charcoal producers through production/construction of RE systems
- d. It has developed four business entities and three networks in order to support country RE efforts
- e. More than 7,600,000 people have directly and indirectly benefited from TaTEDO efforts on renewable energy services

Challenges

- i. Low purchase power of people (inability to buy services and products) at local levels
- ii. Low priority and inadequate commitment from government on renewable energy services
- iii. Insufficient access to affordable financing for RETS
- iv. Low awareness of the opportunities available in RETS
- v. Social barriers- change of behavior in using renewable energy technologies
- vi. Change of area of focus by donor
- vii. Unstable currency-price fluctuations of our technologies
- viii. Influx of cheap and poor quality products in the market

9.

Environmental Conservation & Energy; Renewable and Clean Energy Solutions

Presenter: Ms. Manon Lelievre

Institution: ARTI Energy



INTRODUCTION TO ARTI ENERGY

ARTI Energy is a collaboration between Appropriate Rural Technology Institute Tanzania (ARTI-TZ) and ARTI Energy Limited. ARTI-TZ is a Tanzanian registered non-political, non-profit making organization, established in 2007, with the mission of serving Tanzania as an instrument of development through the dissemination and application of scientific knowledge and sustainable technologies for energy production, environmental protection, employment and income generating opportunities and ARTI Energy Limited is a commercial enterprise established in 2011 with the mission to identify quality renewable energy products and market them to the Tanzanian consumers with the support of quality sales and service. The synergy of these two organizations forms the spirit of ARTI Energy, socially conscious and dedicated to “Energy, Enterprise & Empowerment.”

ARTI Energy identifies appropriate renewable energy technologies and introduces them to Tanzania by:

- i. Identifying and adapting RE technologies to meet the demands of the local environment,
- ii. Building production and sales capacity and public awareness (training & equipping beneficiaries, consumer sensitizing campaigns),
- iii. Making them available through existing trade channels once technologies are ready for the market (network of wholesalers, dealers, employee programs and micro-finance institutions),
- iv. Completing and working on value chain linking producers to consumers.

ARTI Energy Products

Products from ARTI Energy include improved cook stoves which use charcoal and firewoods. It also produces charcoal briquettes, low cost solar lanterns and phone chargers, solar PV home back-up systems and solar PV systems for institutions.

ARTI-TZ has implemented several projects past and present among them;

- 2013 – 2014 WPower, CARE International
- 2013 Scaling up Sustainable Charcoal Briquette Production in Tanzania, Energy and Environment Partnership (Govt of Finland, England, Austria)
- 2011-2012 Promotion of Charcoal Briquettes in Tanzania, World Bank's Biomass Initiative for Africa (BEIA)
- 2011-2012 Lighting Rural Tanzania, Rural Energy Agency & the World Bank's "Lighting Africa"
- 2011-2012 Biogas Sustainable Energy and Economic Development, RONGEAD (France)
- 2010-2011 Kigoma Lighting & Power Project Dissigno USA
- 2009 Charcoal Briquettes Training in Rufiji, Campaign for Female Education (CAMFED)
- 2008 Azania Secondary School Biogas Project, Tanzanian Commission for Science and Technology (COSTECH)



Improved charcoal stove [left]; Improved firewood stove [center]; Charcoal Briquettes [right]

Sustainable Charcoal Briquettes

The demand for charcoal is creating an environmental crisis as deforestation rates are high in sub-Saharan countries. The demand is increasing in severity as urban population continues to grow. However destructive it may be, charcoal can never be eliminated from the lives of Africans for the foreseeable future. For example, in Tanzania 90% of the energy consumption comes from biomass

which charcoal accounts for a major part. Rural people cut trees to produce charcoal and earn an income urban people buy charcoal because it is cheap and accessible. ARTI Energy cannot address environmental issues without addressing the issue of finding an alternative to wood charcoal that is affordable to consumers and ensures rural livelihoods are not sacrificed.

Charcoal from biomass

Charcoal does not necessarily have to come from trees, it can also be made from agricultural waste or any other dry biomass. Charcoal briquette production uses basic equipment, which it is affordable and requires less work. Also it provides the opportunity for women and youth to gain employment in the charcoal industry and increase their incomes. The quality of briquettes is as good as or better than traditional wood charcoal. Charcoal briquettes reduces deforestation and Greenhouse Gas emissions, contributes to environmental preservation and climate change adaptation.



Goals of producing charcoal briquettes

- i. Provide a reliable and sustainable alternative to existing wood charcoal
- ii. Reduce the pressure on the forests for wood for charcoal by proving that agricultural waste and other dry biomass are better raw materials to make charcoal.
- iii. Reduce GhG emissions by reducing deforestation.
- iv. Improve incomes for rural inhabitants by providing market linkages
- v. Provide the opportunity to women to earn incomes from manufacturing charcoal briquettes
- vi. Make available additional farm land for cultivation
- vii. Install self confidence in rural inhabitants resulting in a number of socio-economic benefits.

Sustainable Charcoal Briquettes in Dar-es-Salaam and surroundings

Goals of the project were to:

- i. Provide a reliable and sustainable alternative to existing wood charcoal
- ii. Reduce the pressure on the forests for wood for charcoal by proving that agricultural waste and other dry biomass are better raw materials to make charcoal
- iii. Improve incomes for rural inhabitants by providing market linkages
- iv. Provide the opportunity to women to earn incomes from manufacturing charcoal briquettes
- v. Make available additional farm land for cultivation
- vi. Install self confidence in rural inhabitants resulting in a number of socio-economic benefits

Project implementation

- i. ARTI-TZ is training and equipping 720 Tanzanians, from 24 villages in 2 districts, Bagamoyo and Kibaha, to produce char powder using agro-waste and other dry biomass. The trained groups were assisted and financed to form two Community Based Enterprises (CBEs) to commercially produce and sell the charcoal briquettes. Also CBEs through the support of ARTI-TZ are developing promotion and marketing campaigns. The CBEs are owned by the members of the trained groups (30%), a CBE Manager (10%) and ARTI Energy Limited (60%).CBE currently have a capacity to manufacture 120 tons charcoal briquettes annually. From April 2013, the briquettes production increases to 2000 tons/year. ARTI-TZ is currently working to utilize the existing wood based charcoal supply chain by sensitizing urban charcoal retailers and transporters and the end users.

Project Impacts

- i. Environmental Impact
 - a. From formation of the CBEs (Dec 2011): Briquettes produced = 3,830 kg Capacity increased to 2000 tons/year in Sept 2012
 - b. Tons of dry biomass used
 - c. Impact on deforestation will be seen over a period of time
 - d. Use of charcoal dust
- ii. Health impact
 - a. Effect on Indoor Air Pollution: users have reported that the briquettes burn smokeless and hence has resulted in reducing the Indoor Air Pollution
 - b. Impact on the community
 - c. Villages trained, equipped and organised
 - d. Job creation and Income Generation, char producer own 30 % of CBEs' shares.
- iii. Gender-specific impacts
 - a. 50% of the villagers trained are women

KEY STEPS ABOUT CHARCOAL BRIQUETTES PRODUCTION

Carbonisation of dry biomass

The kiln is filled with biomass. The biomass is lit with matches at the top then the kiln is closed with the lead and the chimney. Then pyrolysis process takes place from 10 to 40 min depending on the type of biomass and its moisture content. 10 KG of dry biomass give an average of 3.5KG of char powder. Once the char powder has cool down, impurities are removed.

Manufacturing of charcoal briquettes

Ideally using char powder from various raw material makes the best quality briquettes, charcoal dust is also included. Some raw materials such as sawdust, coconut husks and charcoal dust, are better than others. Typical ratio: 50% charcoal dust / 40% coconut husks& shells / 10 % other, binder used is cassava peelings and leftovers which are sun dried then grinded. The cassava flour obtained is boiled with water to make a light “porridge”. The common ratio is 50KG char powder / 3 KG Binder. The mixture is processed through the extruder. Moisture content of the mixture is a critical point as it ensures its right consistency hence a better efficiency. Currently the preparation is done manually. The briquettes are then dried in the sun. It takes from 4 to 10 days.

Manufacturing is done at the Community Based Enterprises which are equipped with;

- a. Char powder storage area,
- b. Electrical briquette extruder with a capacity of 500KG/day,
- c. Drying area with a current capacity of 2 tons.
- d. Packaging area,
- e. Binder production area, and
- f. Briquette storage facility.



Packaging of briquettes

ARTI Energy packaging options as well as the brand name were decided based on MIT students' market analysis. Currently we have 4 types of packages: 1.5KG, 4KG, 15 KG, and 25KG. ARTI Energy

are currently searching for new types of bag and labelling options which will include the logo and basic information.

Sales and promotion

Major clients are wood charcoal retailers who now promote sustainable charcoal briquettes alongside normal charcoal. Institutions such as schools, hotels, bakery and soon supermarkets will join our supply chain. ARTI participates in big events such as Dar-es-Salaam International Trade Fair, BBQ festivals. We also conduct demonstration and sensitization at retailers' spots and branding of shops, Radio/TV, and distribution of flyers as its promotions measures.

Benefits of using charcoal briquettes

- i. Health
- ii. Smokeless
- iii. No sparks
- iv. Economical
 - v. Burns longer than usual charcoal
 - vi. Use a smaller quantity to cook food
- vii. Environmentally friendly
- viii. Reduces deforestation
- ix. Recycle waste
- x. Adaptation to climate change
- xi. Creates employment and incomes Especially for women and youth, for urban and rural communities



Charcoal packaging briquettes [left]; Sales and promotion efforts [center]; Charcoal briquettes in use [right]

ENVIROFIT IMPROVED COOK STOVES

The use of improved cook stoves will reduce the need for large quantities of charcoal and firewood for cooking activities. Users are able to complete the same cooking tasks while significantly reducing their demand for wood-based fuels. This means reductions in demand for wood resources, reducing deforestation rates. ARTI Energy imports and distributes improved cook stoves from ENVIROFIT. ENVIROFIT, cook stoves have been designed in the Colorado State University, USA with African consumers in mind. Stoves are manufactured with a patent-pending metal (a Titanium Alloy) that enables the stoves to be very well insulated and durable. Envirofit cook stoves' special design and material are reduce charcoal and wood fuel required for cooking by up to 60%, smoke and soot by 80% and cooking times by 50% . All Envirofit cook stoves have a 5 year limited warranty and their price is affordable as a result of Carbon Credit Financing.

Solar Kits

ARTI Energy supplies and installs various sizes of solar systems and solar kits from Barefoot Power and Green Light Planet which are easily available through ARTI Energy dealer network. These products are affordable, efficient and easy to install and to use. Products are range from solar lantern (1 W) to lager systems of 7 lights plus phone and radio charger (15 W).

10.

Environmental and Energy Conservation Project V/S Climate Change

Presenter: Mr. Solomon Mwenda

Institution: Solar Oven Society Africa



INTRODUCTION

In most developing countries fuel wood and charcoal remains the principle source of domestic energy. This is creating increasing pressure on forests and woodland and resulting into different levels of deforestation. In Tanzania, over 90% of round wood harvests are used for charcoal making and fuel wood which has led to over alarming forest degradation. For instance about 70% of deforestation in Tanzania is used for fuel harvest with about 30% of deforestation being as a result of agriculture purposes. The research shows that from 1990 to 2005 the country lost about 37% of its forest for human activities therefore with population estimated to 45million in which the deforestation is likely to increase unabatedly in the near future. Thus the overwhelming dependence on wood fuels for energy is greatly contributing to environmental degradation which is giving rise to a number of concerns for instance deforestation which is believed to account up to 25% of global emissions of gases while thousands of life's are lost due to climatic change.

Research shows that in Tanzania about 94% of the country energy requirement is met by biomass which is fuel wood, other energy is provided by other source including solar, biogas and liquefied petroleum gas(LPG) underutilization of commercial energy sources indicates that many economic activities are carried out using traditional low energy technologies particularly in rural areas. A larger proportion of the national energy consumption about 79% is used for domestic use mainly cooking and lighting and more than 80% of the total energy is consumed in rural areas. Fire wood is the predominant source of energy 93.4% for cooking in the rural areas and charcoal is more used by households having higher incomes mostly urban area.

PROJECT DESCRIPTION

The renewability of wood biomass in Tanzania is questionable, due to heavy dependence of biomass for energy supply especially in rural areas as compare to other places. Many regions in Tanzania are now experiencing acute scarcity of wood fuel due to uneven distribution of forest resource. Deforestation and scarcity of biomass fuels in general affect women and children as they walk long distances to fetch fuel wood.

Project aims at;

1. Introducing clean technology by using solar cookers, to enhance domestic energy systems.
2. Restoring environment through tree planting.
3. Providing solar light to students in schools and for home.
4. Installing solar panels to hospitals, dispensary, institutions and in schools to enhance energy systems.
5. Installing Solar Street lights throughout the country.

THE GOAL AND THE PURPOSE THE PROJECT

The goal of this project is to improve the live hoods and quality of life of the people through exploiting the market and non-market benefits of domestic solar oven, solar light and panel installation and tree planting.

The main aim of the project is to develop a commercially viable domestic solar energy system and support tree planting to mitigate greenhouse emission

PROJECT OBJECTIVES AND RATIONALE

1. To introduce solar cookers, Solar panels and led lamps as alternatives domestic energy.
2. Installation of solar panels in dispensary, hospital and schools commercially.
3. To promote tree planting activities in the areas of the project and awards solar cookers
4. To create local capacities to integrate the solar technologies in house hold energy systems
5. To build local community capacities to access the global environment protection facilities also carbon credit
6. To provide civic education on the effect of greenhouse gases emissions and measure to overcome it.



Handing over a solar cooker [left]; demonstration of a solar cooker [right].

Solar based domestic energy will contribute to sustainable development and reaching the Un Millennium Development goals (MDGs); the benefits of solar cookers and led lamp are to

- a) Reduce human pulmonary infections generated by use of biofuel
- b) Reduce greenhouse emissions
- c) Reduce indoor air pollution resulting in a reduction of eye and respiratory illnesses particularly women who most of the time exposed to smoke.
- d) Reduce fuel expenses traditional domestic fuels are increasing becoming part of formal economy of people of target places.
- e) Reduce deforestation by reducing demand of fire wood by introducing this technology.
- f) provide income generation opportunities by providing an energy source of different economic activities
- g) Reduce workload especially to women who spend almost 7hrs a day fetching for fire wood.

PROJECT IMPLEMENTATION APPROACH

The strategy for the implementation of this project involves three main activities and interventions;

- a. Distribution of solar cookers, lamps and panels to the people
- b. Trees planting in four pilot project districts
- c. Environmental education to communities and school children.

The following are proposed centers which will be committed to specific areas in

- i. Generating energy
- ii. Providing knowledge on renewable Energy
- iii. Conducting promotional awareness raising through education
- iv. Adapting research, and development markets

- v. Providing local based services to meet the needs of the communities.

CONCLUSION

The future of global environments is highly depending on today's accomplishments in conservations. Let's join hands to create a better future for next generation. Trees are our Partners; we shouldn't destroy them in any form and instead plant as many trees as we can. "Until the last tree has been cut down, then we will realize that we cannot eat money". Remember Environmental Conservation is a command from God. Genesis Chapter 2:15, The Lord God took the man and put him in the Garden of Eden to work it and keep it. If one cannot listen to us, then at least listen to the words of God to keep the Environment.

7.

Challenges for Small Energy Entrepreneurs in Accessing Finance from FIs

Presenter: Mr. Helmut Nyoni

Institution: GVEP



INTRODUCTION

At one point or another, small energy entrepreneurs find themselves seeking for financiers. Entrepreneurs need financing in order to start a business or when they specifically need to increase the business work force or increase inventory that is working capital. Other reasons include the need to serve the expanding into new markets, whereby an entrepreneur may want to borrow in order to enter new energy markets. Capital purchase is another reason in which an entrepreneur may need to finance new energy equipment for the business into a new market or expand to another energy product line. Moreover, the need to improve the enterprise's cash flow also requires financing. Sources of financing can be from savings, relatives and friends, grants or lending from FIs.

Challenges of small energy entrepreneurs in accessing Finance from FIs are;

- i. Lack of awareness of energy enterprises by FI's.
- ii. Most FI don't have specific energy portfolios
- iii. High interest rates charged by FIs.
- iv. FIs requirements:
- v. Collateral
- vi. Business plan
- vii. Credit history
- viii. Bank statement

HOW DOES GVEP ADDRESS FINANCING CHALLENGES?

Loan Guarantee Fund;

Initiated in 2009, implemented 2010 with the aim of increasing access to investment finance for energy entrepreneurs. Loan Guarantee Fund is the bridge gap between financing institutions and energy entrepreneurs. Fund is structured as a revolving fund portfolio of guarantees are made with FI's.

Selection of FIs for Financial Linkage;

Challenges include difficulty in finding right FIs to work with and long time, about 4-5 months, is spent to conclude contractual agreements. Also lack of awareness of energy enterprises by FI's and some of which are not attracted by small amounts of guarantees.

MOU with Financial Institutions

In this case, terms and conditions are to be set and mutually be agreed. It is important to specify the role of GVEP and the role of FI.

Steps for selection of entrepreneurs for linkage covers;

1. Attended Technical, Finance and Business Management Skills training
2. Products need assessment done by Regional Business Mentor (RBM) and Technology Mentor
3. With support from RBM – Business plan completed
4. Loan appraisal form filled jointly by entrepreneur and RBM
5. Evaluation of application forms by Coordinators and Finance Access Officer
6. Selected entrepreneurs linked to FIs.
7. Evaluation of entrepreneurs by FIs.



MOU signing with TPB [left]; Mr Frank Gilbert—Entrepreneur [right].

CASE STUDY - FRANK GILBERT

Frank Gilbert lives in Mahina – a new but typical rural settlement with no access to the national electricity grid. Frank initially invested his own savings into a small solar panel and all the equipment necessary and he was charging around 15 phones a day. Now, with the help of GVEP, Frank has been able to set up and expand his own phone charging business. GVEP's training provided him with the technical expertise, and knowledge of marketing and customer care. "I have learned how to interact with customers correctly", he says, "and especially the importance of being polite!" Frank now promotes his business with a written sign at the top of his shop. The demand for his services increased. Frank applied for a loan for a bigger panel (costing 3 million TSH) with a higher voltage able to support this. GVEP helped Frank to secure the loan from WADOKI SACCOS, without which it would not otherwise have been possible, his sales now has increased and now charging average of 100 phones a day @ 300/= he has diversified and now started to stock portable solar lights. "I am only 22, he says, but I support my family, I pay school fees for two young brothers. I have bought 3 plots which I am planning to develop"

8.

Clean Energy Options; Sustainable Energy and Development Centre (SEDC)

Presenter: Mr. Hasssan Bussiga

Institution: SEDC



INTRODUCTION TO SEDC

The Centre was established few years ago as Energy technologies Centre with the intention of availing knowledge and skills of renewable energy and environment to the rural community. Also, SEDC was established with the aim of developing and managing sustainable energy knowledge through studies and applied research, tailor-made training, publication and consultancy. The centre is a knowledge development for better decision making in investments and development programmes. SEDC is a non-profit sharing company, under the companies' act of 2002 since April 2009 with registration No 70684. The centre is located in the per-urban areas of Dar es Salaam about 21 km from city centre.

Vision

To be a leading knowledgeable Centre on sustainable energy and development issues.

Mission

To advance knowledge on sustainable energy and development in Tanzania and elsewhere through: research, studies, consultancy, tailor-made training and publication

Goal

Is to develop capacity and provide skills and knowledge on sustainable modern energy technologies and services as to ensure increased access and affordability of sustainable energy services in rural and urban communities of Tanzania.

Stakeholders of SEDC

- a. The Local industries and services provider
- b. Government ministries and agencies
- c. Small and medium enterprises (SMEs)
- d. National and international research institutions
- e. Non-governmental organizations (NGOs)
- f. Students and Researchers
- g. Development partners
- h. Local Government

INTRODUCTION TO CLEAN ENERGY (CE)

CE is the energy that is sustainable, combining Renewable Energy and energy efficiency with minimal negative environmental impacts. In other words low emission sources of energy. Increasing access to energy is critical to supporting human and economic development. Fossil fuels and other conventional energy sources have negative externalities, including pollution and public health impacts. Clean energy sources benefit ecosystems and the environment and help protect natural resources that poor communities often rely on. Clean, decentralized renewable energy is often the most appropriate means of providing holistic energy services in rural areas that support both economic and social development clean energy for access is economically feasible in comparison to conventional technologies, particularly for areas at a distance from the grid.

CLEAN ENERGY PROMOTION, WHO'S RESPONSIBILITY?

- a) Ministry of Energy and Minerals and other related Ministries- Create enabling policies, strategies, regulatory and incentives, programs for different stakeholders and market to participate and function in the SMET development, including necessary financing to ensure effective policy implementation.
- b) Government Agencies (REA /REF, COSTECH, NEMC, EWURA, etc.):- Supporting private sector, Coordinating, regulating, facilitating/funding agencies to ensure the success of the initiatives by energy projects and business developers.
- c) Local governments (District and village): Should create local enabling environments for NGOs, CBOs, private sector and financial actors to operate. Also develop local energy resources data base.
- d) NGOs: Should raise public awareness/education, build capacity, mobilize communities, mobilize financing, and provide extension services, technical and material support to energy entrepreneurs, community groups and beneficiaries.
- e) Private and commercial sectors: Should promote and market appropriate, affordable and proven clean energy technologies and services to users of energy technologies on commercial basis.

- f) Development partners/donors: Should avail more financial resources to increase investments and services within the approved national SMET development strategy and targets.

SUSTAINABLE ENERGY TECHNOLOGIES AT SEDC

Sustainable Biomass Energy Technologies

Sustainable charcoal production i.e. Half Orange Kiln, Improved Earth Mound Kiln, Retort Kilns, Improved wood stoves, Improved charcoal stoves and ovens and Alternative Fuel- Briquettes production

Solar Energy Technologies

Solar Home Systems, Solar Dryers, Solar Water Heaters and Solar Multi chargers

Knowledge and Skills on Biofuels

Research on Biofuels production i.e. Jatropha growing, Research on Biodiesel Micro- Processing, Knowledge on utilization of Biofuels for mini grids electrification by using Energy Services Platforms

List of Courses Offered by SEDC

SN	Course Name	Course Duration	Full Training Fee
1	Domestic Electrical and Solar PV Systems	10 Days	TZS 300,000 OR USD 300
2	Food processing and solar drying of fruits and vegetables	5 days	TZS 200,000 OR USD 200
3	Baking (Cakes and Bread) by Improved Ovens	5 days	TZS 150,000 OR USD 150
4	Efficient Charcoal and Briquettes Production	5 days	TZS 250,000 OR USD 250
5	Energy Entrepreneurship skills	4 Days	TZS 300,000 OR USD 300
6	Installation of Fixed Dome Biogas Plant	15 Days	TZS 400,000 or USD 400
7	Improved Cook Stoves (ICS)	10 Days	TZS 250,000 OR USD 250

9.

Financial Institutions, Entrepreneurs and Large Energy Users

PRESENTATION 9-1: FINANCIAL INSTITUTIONS – WADOKI SACCOS

Presenter: Mr. Deogratias Peter

Institution: WADOKI

WADOKI stands for Kirumba Ward Small Traders. It is a savings and credit cooperation, in which members take a loan after contributing about 10% of it in savings. It was found in 1997 and officially registered in 2001. WADOKI is currently working round the Mwanza region and has 1876 members. It has provided 18,000 loans worth 16.5 billion shillings, among them 45 million shillings to small traders or entities dealing with energy products or services.

Among the major challenges for the energy sector is limited awareness of financial institutions on renewable energy. Therefore, it is difficult for small traders or service providers in energy field to get credit. WADOKI advocates for energy entrepreneurs to get loans from financial institutions. This can be achieved if financial institutions understand the specific requirements of different groups of entrepreneurs dealing with energy or renewable energy. Among the entrepreneurs served by WADOKI 15% were introduced by GVEP. No defaulter of loans for renewable energy business since such businesses operate smoothly with reasonably short payback period.

PRESENTATION 9-2: ENTREPRENEURS - JIKO BORA ENTERPRISES

Presenter: Mrs. Fausta Ntara

Institution: Jiko Bora

We are registered as Jiko Bora Enterprises. I was trained in making efficient stoves by TaTEDO in 2003. I also learned how to make the ovens for bread and meat from Kawe technicians who visited. I pay these technicians by using the money I get from the sales of efficient stoves in addition to the TSh 2,000,000 prize which I won in parallel with BDG competition. Through GVEP, I got a loan of Sh 3,000,000 from SIDO and then I also had TSh 5,000,000 as 9 months loan from Equity Bank. Right now I have 6 employees, among them three women who are the Director, Accounting Officer and a Storekeeper. The rest are three men who are the technicians.

Currently we make stoves for use in households, hotels, schools and other institutions. We get customers through the promotion organized by GVEP. Through SNV, I have been able to facilitate the teaching programme for entrepreneurs in Musoma and Kagera. I have also taught in Sengerema in partnership with the Sengerema District Council. Through this business I have built a modern house and I bought modern work tools like drilling machine, cutting machine and welding machine. Challenges include a lack of facilities, expensive raw materials and the limitations in transportation of our products to the consumers.

PRESENTATION 9-3: ENTREPRENEURS – PHONE CHARGING SERVICES

Presenter: Mr. Frank Gilbert

I am a phone charging entrepreneur from Mwanza. I received training on Solar PV phone charging from GVEP. Through GVEP, I accessed a one year loan of TSh 1,000,000 however I managed to pay it back within six months. I have been able to construct kiosk for my business at cost of TSh 700,000 and I have bought a solar charger. My clients have increased. I have bought three sites for building residential houses and I pay for education of my three younger brothers. Among the challenges I face, is the habit of my customers arguing that they need to recharge their phones even more frequently if they charge at my kiosk.

PRESENTATION 9-4: ENTREPRENEURS – GAS VENDING

Presenter: Mr. Issa Mangapi

My fellows, seminar participants, I would like to inform you that gas is also a clean energy. It allows cooking without hassle. It can contribute in bridging the gap between sexuality by allowing men to cook very effectively. If you gas for cooking, you will only spend energy necessary for that specific cooking task. This is not the case with cooking by using charcoal, whereby you will always charcoal burning after finishing your cooking tasks and therefore you lose energy.

PRESENTATION 9-5: LARGE ENERGY CONSUMERS – KIGOMA SECONDARY SCHOOL

Presenter: Mr. Kandius Hyera

Institution: Kigoma Secondary School

Initially we were using wood stoves which spent 135 m³ per month. These stoves produced a lot of smoke and the heat losses led to high temperatures inside the kitchen building. After getting efficient institutional stoves through the Lake Tanganyika Conservation Project (UNDP / GEF) from the Office of the Vice President, we now spend an average of 70 to 80 m³. These stoves can use the 15 pieces to cook a large pot of beans. Through DANIDA support, we have also got other stoves which use 20 pieces of firewood to cooking bean. We have planted some trees

but our efforts are discouraged by neighboring communities which cut and badly enough set the trees on fire.

PRESENTATION 9-6: LARGE ENERGY CONSUMERS – MATYAZO HOSPITAL

Presenter: Mr. Jangwe Anania

Institution: Matyazo Hospital

We use wood fuel to boil water mainly for laundry purposes. Earlier, we planted eucalyptus trees in order to getting wood fuel however the demand for wood fuel was high and kept increasing. We learned to use efficient wood stoves which reduced our wood fuel consumption significantly. Recently, we are exploring the use of alternative energy sources such as coffee husks.

PRESENTATION 9-7: LARGE ENERGY CONSUMERS – KIGOMA PRISON

Presenter: Mrs. Goreth Bantanuka

Institution: Kigoma Prison

Initially we used about 12 to 13 m³ of wood fuel per month. After the build efficient institutional stoves facilitated by Lake Tanganyika Conservation Project (UNDP/GEF) through the Office of the Vice President, currently we use 3 to 4 m³ per month. For every stove we use only 7 to 8 pieces of wood.

10.

Questions raised during discussions

- Can JGI extend its services and reach Mpanda district? District Council will cooperate.
- Why the government is not doing enough effort to help protect the environment by supporting sustainable use of wood or charcoal?
- So far, do we geothermal energy in Tanzania?
- How we can generate electricity by using geothermal energy?
- Is nuclear energy among the clean options?
- For low income population at the rural areas, how can they be empowered or enabled to use alternative energy and renewable energy?
- What is the price for cooking stoves from ARTI?
 - Wood fuel stove costs TSh 40,000 and charcoal stove for TSh 50,000.
 - Although these prices are higher than normal stoves, savings in energy and durability of the stoves can off-sets the differences.
- What is the price for briquette making machine from ARTI?
 - Hand operated machine is sold at TSh 150,000 while electrically powered machine is TSh 850,000. Charcoal dust production machine is sold TSh 150,000 price.
- What is the price for phone charger sets from ARTI?
 - 1 light and its module for TSh 25,000;
 - 1 light, the module and a phone charger for TSh 50,000
 - 2 lights, the module, a phone charger and battery for TSh 120,000
- Which type of the soil is required for making stoves?
- Which energy source can be used as alternative fuel for burning bricks?
- What is the price for solar cookers?
- Does ARTI consider about opening branches in some regions and especially Kigoma?
- What type charcoal stoves are suitable for use of charcoal made from the waste?

11.

Recommendations from group discussions

GROUP 1: WHAT SHOULD BE DONE TO OVERCOME THE CHALLENGES ON THE USE OF CHARCOAL?

Discussion points; Efficient production of charcoal, efficient energy utilization and alternative energy sources.

Facilitators; Ms. Manon Lelievre - ARTI, Mr. Helmut Nyoni - GVEP

Charcoal production can be linked with environment problems such as higher rate of deforestation in comparison to forestation. In addition to that, charcoal utilization is associated with charcoal losses such as production site losses, losses along the supply chains but also end use losses. Otherwise, charcoal production poses some health risks such as high temperature environments during production, smoke, harmful gases and dusts. These pose risks such as difficulties in breathing and hence lung diseases. High charcoal production costs are partly contributed by licensing issues.

It is recommended to use of efficient and safer charcoal kiln in order of reducing deforestation but also health problem. Also it is important to encourage the community on the use of briquettes, gas stoves, solar cooker and improved cooking stoves.

GROUP 2: HOW CAN THE LOW INCOME POPULATION BE FACILITATED TO USE CLEAN ENERGY?

Discussion point; Consider that costs associated with renewable energy and energy saving technologies are relatively higher.

Facilitators; Mr. Faustine Msangira - GVEP, Mr. Solomon Mwenda - Solar Oven Society Africa

Alternative energy is the energy which can be used instead of traditional energy such as wood fuel and electricity. Examples of alternative energy are saw dust, biogas, solar heat, solar PV, natural gas, geothermal energy, wind energy, wave energy etc. Improved cooking stoves is the type of stove which uses relatively small amount of wood or charcoal to accomplish a certain cooking task in comparison of traditional cooking stoves.

Investment costs for solar PV systems are high and therefore less affordable low income population. However, operational costs are very low and affordable. Availability of solar energy resource is decentralized and solar energy is friendly to the environment. Awareness campaigns should be done

and financing be mainstreamed. To reduce the cost of solar PV equipment, tax exemption is need as a short term solution however local manufacturing should be considered as our long term target.

Cost of gas is high for majority of our population and supply chains have not made it available at most of the place. Awareness rising, micro financing targeting end users and tax exemption can contribute in reducing the scale of these bottlenecks.

High cost is also a challenge for biogas and repairs are troublesome. Anyway, biogas is friendly to the environment.

Geothermal, wind, wave and nuclear have high investment cost but also operational costs. Government intervention is necessary for these energy options.

We recommend that the Government should support alternative energy sector as it is the case for agriculture sector. Responsible institution should ensure that adequate information on carbon credit scheme is available. Communities should stand against deforestation and research on adoption of improved cooking stove should be done.

Group 3: What can be done to promote the use of clean energy in a community?

Discussion point; Preparation of the communities to adapt clean energy.

Facilitator; Ms. Lilian P. Njuu – TaTEDO

It is important that we strengthen awareness raising on clean energy technology, advantages of use of clean energy and disadvantages of conventional energy. Institutions should be the leading example by adopting appropriate clean energy technologies so that the public can learn from them. Training on the use of clean energy technologies in addition to local manufacturing capacity should be availed to the society. The government should provide subsidy for wide utilization and affordability of clean energy technologies or provide incentives to clean energy users. The government should also give priority on environment and energy sectors in budgetary basis.

GROUP 4: WHAT IS THE ROLE OF FINANCIAL INSTITUTIONS IN CLEAN ENERGY SECTOR?

Discussion point; Aligning the financial institutions towards supporting clean energy businesses?

Facilitators; Mr. Deogratias Peter - WADOKI, Mr. Machumu Malima - SIDO

Advocate clean energy business to financial institutions covering opportunities, pricing and the market potential. Clean energy advocacy institutions such as GVEP should seek collaboration with finance institutions. The government should set at least 1% of its tax collection to support clean energy initiatives through EWURA, NEMC, REA, REF, COSTECH, etc. Through Vice President Office, Ministry of Environment should direct carbon credit funds for promoting more clean energy projects.

GROUP 5: HOW CAN WE CONVINCING THE LARGE ENERGY CONSUMERS TOWARDS CLEAN ENERGY?

Discussion point; soil bricks producers, lime producers, tobacco drying, salt producers.

Facilitator; Mr. Hassan Bussiga – SEDC

For wide spread of clean energy utilization among the large energy consumers, awareness campaigns should be done and environmental conservation policy and/or some regulations be put in place. It is important to discourage deforestation by large energy consumers among them spending thousands of cubic meters of wood fuel per day for heating purposes. Tree planting should be promoted widely.

For lime production, use of modern kilns like the one at Bolombora National Service Camp should be formalized. Otherwise, use of interlocking bricks which uses less cement should be encouraged.

Energy efficient techniques and alternative energy sources such as agricultural waste should be adopted for tobacco drying. Wherever possible, tobacco growers should be encouraged to go for alternative agro-products such as sunflower and sesame production, bee keeping activities as well as livestock keeping.

Salt processing firms should be encouraged to utilize solar energy instead of heavily depending on wood fuel.

12.

Appendixes

APPENDIX A: WORKSHOP TIMETABLE

Timetable for Clean Energy Workshop, Kigoma 30th to 31st October 2013

Day 1 - 30th October 2013

Time	Event	Responsible person	Topic
09:00-10:00	Registration	<i>Ms. Joyce</i> GMU Program	
10:00-10:20	Introductions	<i>Dr. Joseph Kihedu</i> Facilitator	
10:20-10:40	Presentation 1 - 1	<i>Mrs. Mary Mavanza</i> Governance Officer, GMU Program	Introduction to GMU program and Clean energy workshop
10:40-10:50	Opening ceremony	<i>Mrs. Mary Mavanza</i> Governance Officer, GMU Program	Welcoming remarks
10:50-11:00		Guest of Honor <i>Mr. Solomon Shati</i> Planning Officer, Kigoma District Council	Opening Speech
11:00-11:30	Tea break	All	
11:30-12:00	Presentation 1 - 2	<i>Dr. Joseph Kihedu</i> Facilitator	Overview of Clean Energy
12:00-12:30	Presentation 1 - 3	<i>Mr. Demitius Kamtomi</i> Mpanda District Council	Household Energy Utilization at Mpanda and Nsimbo Districts
12:30-13:00	Presentation 1 - 4	<i>Mr. Faustine Msangira</i> GVEP	Findings From a Review of Clean Energy Technologies
13:00-14:00	Lunch break	All	
14:00-14:30	Presentation 1 - 5	<i>Ms. Lilian P. Njuu</i> TaTEDO	Clean Energy Options for Western Tanzania; Experience of TaTEDO
14:30-15:00	Presentation 1 - 6	<i>Ms. Manon Lelievre</i> ARTI Energy	Environmental Conservation & Energy; Renewable and Clean Energy Solutions
15:00-15:30	Tea break	All	
15:30-16:00	Presentation 1 - 7	<i>Mr. Solomon Mwenda</i> Solar Oven Society	Environmental and Energy Conservation Project V/S Climate Change
16:00-16:30	Soft drinks, and departure	All	

Day 2 - 31st October 2013

Time	Event	Responsible person	Topic
09:00-09:45	Registration	<i>Ms. Joyce</i> GMU Program	
09:45-10:00	Demonstration	<i>Mr. Solomon Mwenda</i> Solar Oven Society	Preparations for cooking by using a solar cooker
10:00-10:30	Presentation 2 - 1	<i>Mr. Helmut Nyoni</i> GVEP	Challenges for Small Energy Entrepreneurs in Accessing Finance from FIs
10:30-11:00	Presentation 2 - 2	<i>Mr. Hassan Bussiga</i> SEDC	Clean Energy Options; Sustainable Energy and Development Centre (SEDC)
11:00-11:30	Tea break	All	
11:30-11:45	Presentation 2-3-1	<i>Mr. Deogratias Peter</i> WADOKI	Financial Institutions – WADOKI SACCOS
11:45-12:00	Presentation 2-3-2	<i>Mrs. Fausta Ntara</i> Jiko Bora	Entrepreneurs - Jiko Bora Enterprises
12:00-12:15	Presentation 2-3-3	<i>Mr. Frank Gilbert</i>	Entrepreneurs – Phone Charging Services
12:15-12:30	Presentation 2-3-4	<i>Mr. Issa Mangapi</i>	Entrepreneurs – Gas Vendor
12:30-12:45	Presentation 2-3-5	<i>Mr. Kandius Hyera</i> Kigoma Secondary School	Large Energy Users – Kigoma Secondary School
12:45-13:00	Presentation 2-3-6	<i>Mr. Jangwe Anania</i> Matyazo Hospital	Large Energy Users – Matyazo Hospital
13:00-13:15	Presentation 2-3-7	<i>Mrs. Goreth Bantanuka</i> Kigoma Prison	Large Energy Users – Kigoma Prison
13:15-13:20	Demonstrations	<i>Mr. Solomon Mwenda</i> Solar Oven Society	Performance of a solar cooker
13:20-13:25		<i>Ms. Manon Lelievre</i> ARTI Energy	Use of briquettes and improve cooking stoves
13:25-13:30		<i>Mr. Issa Mangapi</i>	How to use natural gas stoves
13:30-14:30	Lunch break	All	
14:30-15:30	Group discussion	<i>Dr. Joseph Kihedu</i> Facilitator	
15:30-15:35	Presentation 2 - 4	<i>Group 1</i>	What should be done to overcome the challenges on the use of charcoal?
15:35-15:40		<i>Group 2</i>	How can the low income population be facilitated to use clean energy?
15:40-15:45		<i>Group 3</i>	What can be done to promote the use of clean energy in a community?
15:45-15:50		<i>Group 4</i>	What is the role of financial institutions in clean energy sector?
15:50-15:55		<i>Group 5</i>	How can we convince the large energy consumer towards clean energy?
15:55-16:10	General discussion	<i>Dr. Joseph Kihedu</i> Facilitator	
16:05-16:15	Closing ceremony	Guest of Honor Kigoma District Council	Closing Speech
16:15-16:20		<i>Mrs. Mary Mvanza</i> Governance Officer, GMU Program	Vote of thanks
16:20-16:30	Group photograph	All	
16:30-17:00	Soft drinks, and departure	All	

APPENDIX B: LIST OF WORKSHOP PARTICIPANTS

1.	Mr. Solomon Shati	Planning Officer, Kigoma District Council	Kigoma
2.	Mrs. Mary Mavanza	Governance Officer, GMU Program	Kigoma
3.	Mrs. Grace Gobbo	GMU Program	Kigoma
4.	Mr Aristedes Kashiula	GMU Program	Kigoma
5.	Mr. Demitius Kamtomi	Mpanda District Council	Mpanda
6.	Mr. Faustine Msangira	GVEP	Mwanza
7.	Ms. Lilian P. Njuu	TaTEDO	Dar es Salaam
8.	Ms. Manon Lelievre	ARTI Energy	Dar es Salaam
9.	Mr. Solomon Mwenda	Solar Oven Society	Dar es Salaam
10.	Mr. Helmut Nyoni	GVEP	Mwanza
11.	Mr. Hassan Bussiga	SEDC	Dar es Salaam
12.	Ms. Joyce	GMU Program	Kigoma
13.	Mr. Deogratias Peter	WADOKI	Mwanza
14.	Mrs. Fausta Ntara	Jiko Bora	Mwanza
15.	Mr. Frank Gilbert	Mwanza	
16.	Mr. Issa Mangapi	Kigoma	
17.	Mr. Kandius Hyera	Kigoma Secondary School	Kigoma
18.	Mr. Jangwe Anania	Matyazo Hospital	Kigoma
19.	Mrs. Goreth Bantanuka	Kigoma Prison	Kigoma
20.	Mr. Cheyo Mayuma		
21.	Mr. Hashim Hamisi		
22.	Mr. Ulimwengu Amiri		
23.	Mrs. Zabibu Kikondo		
24.	Mrs. Asia Yahaya		
25.	Mr. Hamisi Chikiza		
26.	Mr. Japhet Kawimbe		
27.	Mr. Elishaphat Ruzemya		
28.	Mr. Leonard Nzilayilunde		
29.	Mr. Addallah Kakoso		
30.	Mr. Justin Lusambo		
31.	Mr. Hamisi Musa		
32.	Mr. Petro Masolwa		
33.	Mr. Msangi		
34.	Mr. Felix Herman		
35.	Mr. Abdul Mwilima		
36.	Mr. Rutahwa Mulokozi		
37.	Mr. Fidelis Katama		
38.	Mr. Bernado John		
39.	Mr. Asheri Petro		
40.	Capt. John James		
41.	Mrs. Petronila Gwakisa		
42.	Mr. Adam Lutta		
43.	Mr. Hamisi Chinduli		
44.	Mr. Musa Omari Ngina		

- 45. Mr. John Mike
- 46. Mr. Abel David
- 47. Dr. Joseph Kihedu

Lecturer, University of Dar es Salaam

Dar es Salaam