



Bio Energy Association of Sri Lanka

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GREEN ENERGY

Setting up an energy village in Thirukkivil, Ampara District under Post
Tsunami Ecosystem Restoration Project of the IUCNSL

by Dr Gamini Kulatunga

Background

The goal of the project is to contribute to the ongoing rehabilitation programme and assist in the restoration of ecosystem and livelihoods in the coastal region affected by the tsunami.

In line with the project objectives, enhancement of livelihoods through gliricidia plantation was to be pilot tested in the project area. Several methods of establishing nurseries and maintaining them till the plants are ready for replanting, and multi-use of gliricidia as a fodder, fuel and soil-nutrient were to be demonstrated in the pilot project.

The market opportunities for products of gliricidia were to be explored and the possibility of extending the project to cover livestock was to be studied for later implementation.

The scope of the project was to introduce planting of gliricidia for multiple benefits, establish a plant nursery and resource centre and motivate selected communities from the project area to undertake planting by the families at adjacent villages of Periya Kalapuwa lagoon.



Implementation

The work was carried out with assistance from the IUCNSL field office at Thirukkivil and with the guidance of Ms. Jegatheeswary. A valuable resource person from the area was found namely, Mr. P. Thurairajah of the Korai Estate of the Coconut Cultivation Board.

Several nurseries were established to provide plants for the new settlement where the tsunami-affected people are now relocated. 35,000 plants were established in three nurseries to demonstrate various methods of establishing plant nurseries to suit specific needs. Another 15,000 sticks were planted directly on the new settlements as live-fence material. The planting material obtained from locality were cut to five-foot, three-foot and one-foot pieces and established in nurseries that were supplied with pumped water. The small pieces were planted in polythene bags and kept under cover for faster growth. These were used for long-distance transport whereas the rooted plants from the nurseries were used for close-by distribution. Several awareness raising programmes were held to explain multiple uses of gliricidia and one immediate need that was identified at the sessions was the use of sticks in domestic



Future possibilities

Most of the nursery plants have been established in the home gardens in the new settlements. The need for rearing cattle for milk was expressed by many of the farmers but the space available is rather restricted on the new settlements.

We will explore the possibility of setting up commonly-owned cattle shed and grazing ground in the area, based on the experience of the fisher community in sharing the aquatic resources in Periyakalapuwa.

This approach will also create opportunities to collect gliricida leaves as cattle feed supplement and also process the excess for distribution. Setting up a bio-gas plant to meet immediate thermal and lighting needs is proposed as the household are supplied with grid-connected electricity.

When the gliricidia planting is extended and could meet excess demand after meeting fire wood needs of the community, a supply chain could be established to meet the fuel needs of nearby dendro power plants planned.

The concept of energy village is not confined to energy in the form of thermal and electrical energy but to cover all aspects of energy needed in a community that is engaged in agriculture and aquaculture.

The most energy consuming part of agriculture is the use of Urea which we intend to replace by gliricidia. This will also help to restore the ecosystem now affected by eutrophication due to excessive use of chemical fertilizers.

At present Urea costing Rs. 140 per kg is given to Paddy farmers at Rs. 7.00 per kg. The value of gliricidia leaves at the market price of Urea is Rs. 2.80 per kg (assuming 50kg of leaves = 1.0 kg Urea)

The other energy intensive component in agriculture is land preparation and transport which we intend to replace with draft-power. The animals will be fed with biomass grown in the village supplemented with gliricidia.

The food needs of the people, the most vital form of energy, will be met by supplementing food, from home garden and aquatic sources, with milk. Not only the food will be made available from within but it will also be produced in an environmentally benign manner. The food will be nutritious and free of chemicals.



CLIMATE CHANGE AND SOURCES OF ENERGY IN SRI LANKA

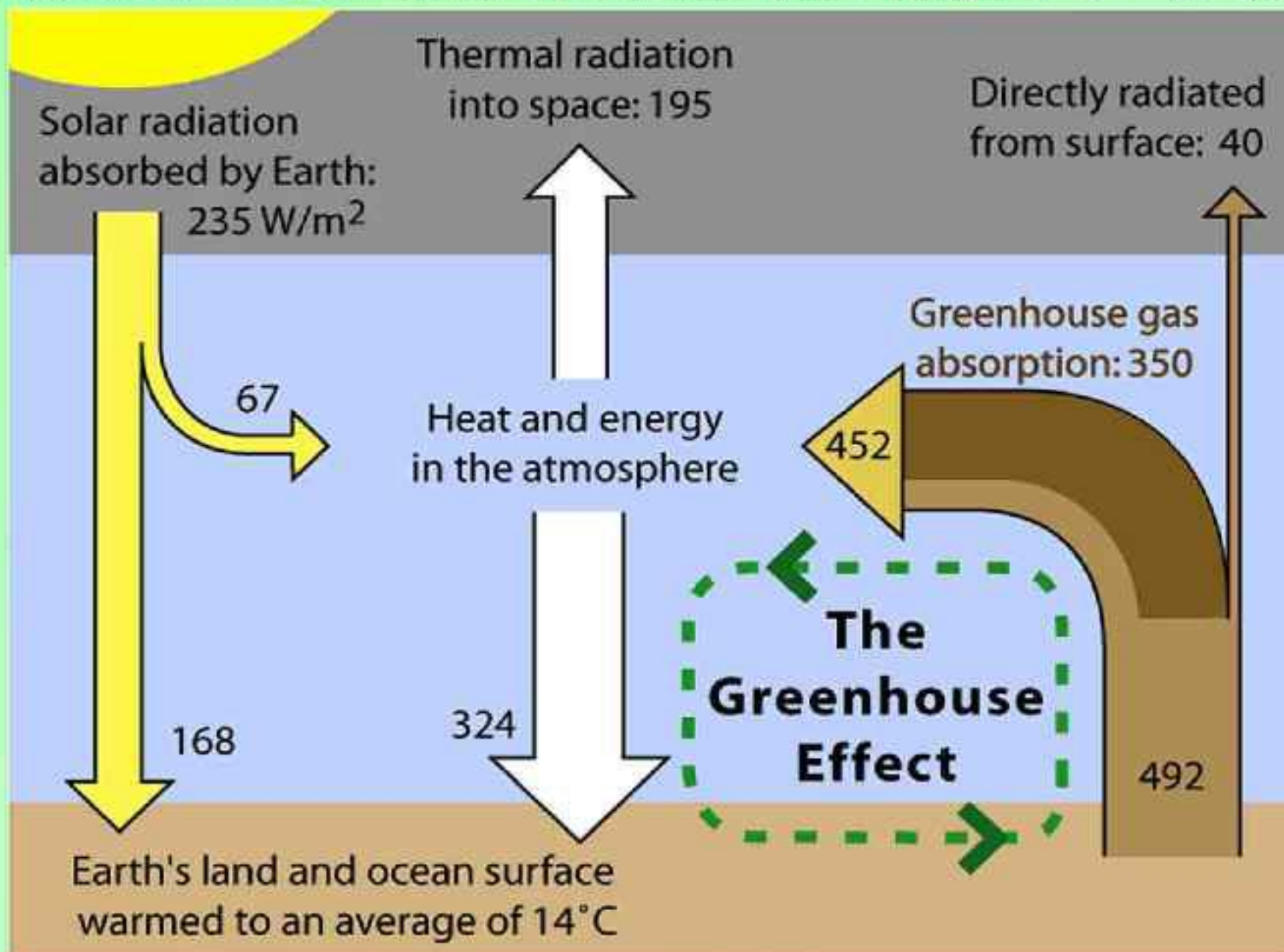


BEASL

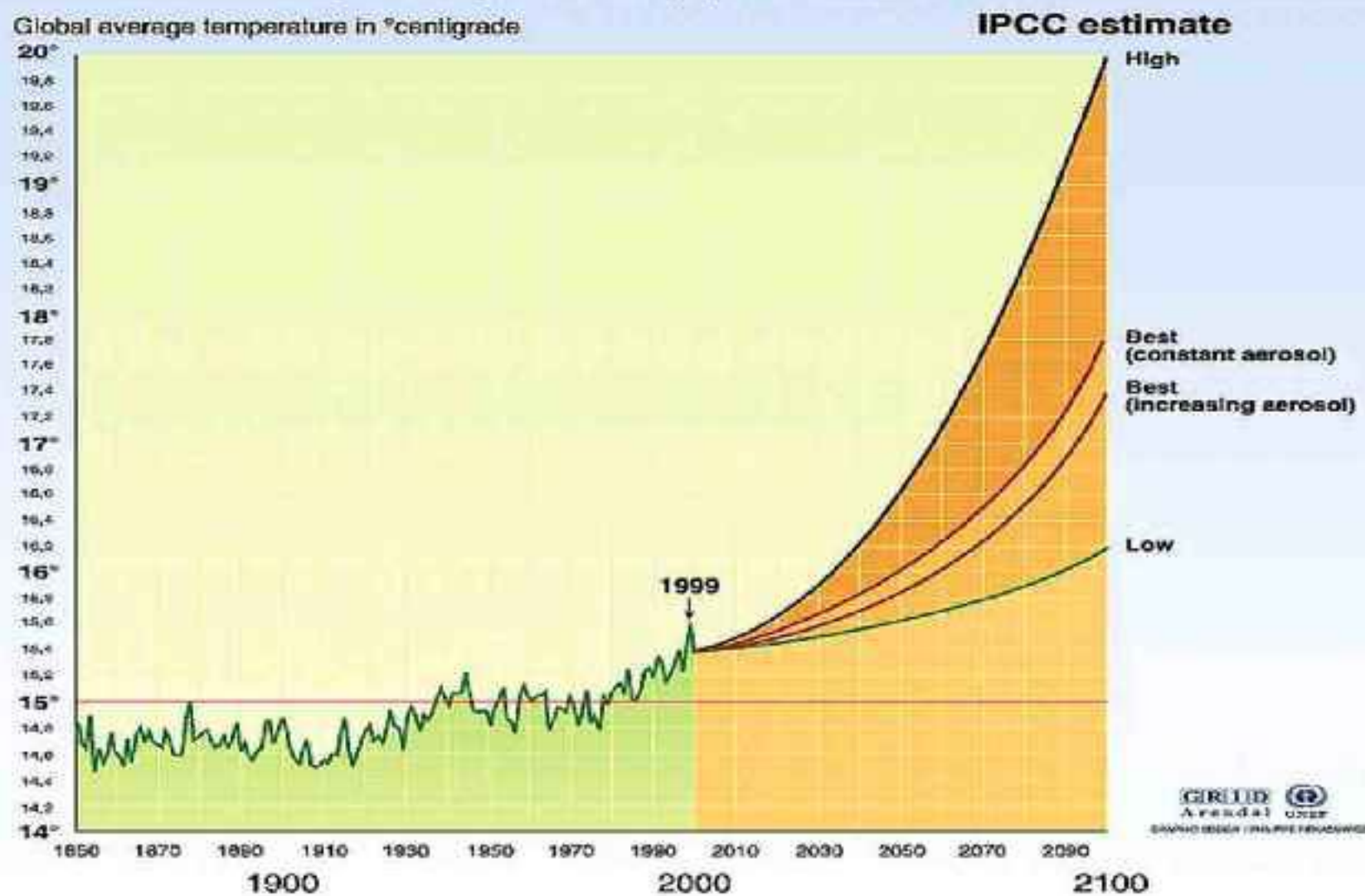
Introduction -

The specter of global warming which has been under discussion over several decades has now definitely moved from the realm of scientific theory and speculation. It's is now a stark reality rather than a prediction of possible disaster that would befall humanity. The latest publication of the IPCC, (Fourth Scientific Report) is very definite about the changes that have already occurred and the alarming trends that are now firmly set in place.

The temperature balance in the earth atmosphere is in a delicate balance, of the solar energy received by the earth and the reradiating of a definite proportion of this radiation back to space. For many millennia the correct concentration of the Green House Gases (GHG) have managed to keep the average temperature of the earth at a comfortable range of 14- 15 deg Celsius .



Projected changes in global temperature:
global average 1856-1999 and projection estimates to 2100





Sri Lanka's Position

Sri Lanka has not contributed in any significant way to the global warming either in absolute terms due to our small economy or by way of per capita emissions. We remain at about 0.6 kg per capita Vs the 30 kg per capita emitted by the average American. However our emissions have increased steadily and at present it is 230% of the 1990 levels. This is mainly due to the increased use of fossil fuels

for power generation and in transport. With the commissioning of the coal power plants presently under construction and planned for the future, this contribution would increase several fold. It is therefore necessary for Sri Lanka too, to make conscious efforts to desist from this trend as a good global citizen. While it is our moral obligation, it is also to our advantage, as we can cash in on such laudable efforts by the Clean Development Mechanism. It is no longer possible for us to say that we are not contributing to climate change.

Sri Lanka's Potential for Carbon Trading.

The current world demand for carbon credits under the KP is estimated at about 5.5 Billion Tons, this remains largely unfulfilled with only about 1.2 billion tons traded. Of the 2029 projects registered under the CDM world wide, Sri Lanka accounts only for six projects all of which are of small magnitude.

However, the recently established Lanka Carbon Fund has estimated the potential of the Sri Lankan CDM market as in excess of 6,000,000 tons . This is dominated by the power sector by the use of renewable resources such as Hydro, biomass, wind and perhaps ocean thermal energy potential .

It will be noted that the largest contribution will come from power generation projects using renewable resources and fuel switching for industries from fossil fuels to sustainably grown wood. Targeting these easily achieved potential Sri Lanka has the potential generate an income of the order of Euro 85,000,000 annually based on current market rates of CERS.

The renewable energy potential of the country has been estimated to be several times the current imports of fossil fuels as shown below

- Hydro - 360 ktoe /Year (balance potential)
- Bio Mass - 16,000 ktoe/Year
- Wind - 3440 ktoe/Year
- Solar - 8,600,000 ktoe/Year
(Solar Thermal/ Photo Voltaic)

Annual imports of fossil fuels – 4000 ktoe approx.

Note : ktoe- Kilo Tons Oil Equivalent

Source – Energy Conservation Fund (2005)

What is more important is that the renewable energy generation or fuel switching projects, are highly lucrative by themselves even without recourse to CDM, due to the very attractive feed in tariff for the electricity and the huge potential for reduction of cost of energy in the factories by fuel switching.

Although Sri Lanka even now, possess a large resource of such fuel wood and an immense potential for expansion of supplies, the non formal nature of the supplies remains the main objection quoted by financing institutions.



Policies and Regulations Affecting Biomass-Related Energy Sector Development of Sri Lanka

Policy Innovation Systems for Clean Energy Security (PISCES) is a five year research program consortium funded by the UK's Department for International Development (DfID) to develop new knowledge for the sustainable use of bioenergy to improve energy access and livelihoods.

1. Introduction

The need for renewable energy to meet in full or in part energy requirements is created by limitations of fossil fuels and global environmental concerns. In this context biomass based strategies hold great promise for sustainable solutions and is presently being developed worldwide to contribute significantly to the future mix of energy sources. Plants provide a major source of organic substances to our planet, converting sunlight into chemical energy. They include relatively under-utilized forms such as cellulose, hemicelluloses, starch, lipids and lignin that have major potential for use as raw materials for energy and industrial feedstock. A significant impact is expected from biomass energy with respect to mitigation of climate change, development of rural areas and employment options and provision of alternative energy forms.

So as to make biomass energy a sustainable alternative, a holistic approach is needed. This includes consideration of the full biomass supply chain, the quality and quantity of biomass production, conversion of biomass into other energy forms, and management of bioenergy production systems in a sustainable manner with minimal impact on the environment. Therefore, it is high time to look at policies, targets, strategies and practices specific to the biomass sector within the context of general energy policies of Sri Lanka.

Important areas to be considered include: existing National Energy Policy and Strategies of Sri Lanka (NEP&S), national policies of other sectors, the role of the Sri Lanka Sustainable Energy Authority (SLSEA) and the Public Utilities Commission of Sri Lanka (PUCSL), as well as the legal structure relevant to biomass and the institutional arrangements of the government organizations affecting the energy sector.

2. Current Status of the Sri Lankan Biomass Energy Sector

2-1. Energy supply

Sri Lanka's total energy supply is mainly based on three primary resources namely, biomass (47.3%), petroleum (45.3%) and hydroelectricity (7.4%) [1]. 70% of the national biomass consumption is in the informal sector, dominated by household cooking, small commercial and industrial applications.

Biomass use in industry is growing as a result of price increases in petroleum fuels and response to climate change promoting use of green energies as a marketing tool and discharging corporate social responsibilities. A significant number of agricultural processing systems (particularly in tea processing) are switching-over from oil to biomass for thermal energy requirements. In addition to the power plants using waste sugar cane in the sugar industry, which have been in operation for some time, one power plant rated at 1MW is already commissioned by the private sector which is designed to use grown biomass for power generation. The government has declared 'Gliricidia Sepium' a well grown biomass crop in Sri Lanka as the fourth national plantation crop following tea, rubber and coconut and an incentive scheme is already operational to grow biomass as an under-crop in coconut plantations.

2-2. National Targets – Aspirations

There is no specific national target to increase biomass utilization. According to the NEP&S, the government will encourage commercial development of biomass as a new rural industry. Further, it indicates that the government will endeavor to reach a level of 10% of grid electricity using Non Conventional Renewable Energy (NRE). The target year to reach this level of NRE penetration is 2015.

2-3. National Energy Policy & Strategies (NEP&S)

The NEP&S indicate that the Sri Lankan government has already considered development of the biomass energy sector to a commercialized level. The following policy elements in the documents can be considered as proactive policies for developing the bioenergy sector of Sri Lanka:

- **Ensuring Energy Security:** Energy resources used in the country will be diversified and the future energy mix will be rationalized (Section 2.2)

- **Promoting Indigenous Resources:** Indigenous energy resources will be developed to the optimum levels to minimize dependence on non-indigenous resources, subject to resolving economic, environmental and social constraints (Section 2.4)

NEP&S indicates it is expected that 10% of grid electricity will come from NRE resources by 2015 and that the commercial development of biomass will be encouraged and facilitated as a new rural industry, allowing the rural poor to engage in fuelwood farming and participate in mainstream economic activity by supplying electricity to urban load centers. The following can make the NEP&S more realistic in the implementation of policies and strategies.

- By clearly defining the institutional responsibilities and implementing the strategies resulting in greater impacts in achieving the policy implications and

- Defining strategies to achieve the target of generating 10% of grid electricity using NRE resources including assessments of potential and site identifications

2-4. Contribution of Key Linkage Institutions

According to the NEP&S, SLSEA and PUCSL are the main two organizations that have responsibility of promoting biomass based energy sector development activities. However, it is essential to have the involvement of several government agencies for biomass sector development including national research institutions, the Central Environmental Authority (CEA) of Sri Lanka, the Industrial Development Board, agro plantation institutions, forestry sector government bodies, and local governmental bodies. Examination of the current operational activities of these organizations indicates there are different types of related activities undertaken by these organizations. However, they lack coordinated effort and each has no specific institutional policy decisions regarding facilitation of the biomass energy sector of Sri Lanka.

2-5. The involvement of SLSEA

SLSEA is the key government body established under the act number 35 of 2007 by the parliament of Sri Lanka. It was established to develop the renewable energy sector of Sri Lanka. According to the powers and duties stated in the act, SLSEA has the capacity to implement biomass energy projects and is able to positively contribute to technology development, technology transfer and to recommend policy implementations. The board of management consists of secretaries to the ministries of Local Government and Provincial Councils, Industries and Investment Promotion, Lands, Agriculture, Plantation Industries, Environment, Irrigation and Mahaweli Development, Transport, Finance, Science and Technology or

their nominees; and The Director General of the Public Utilities Commission of Sri Lanka. However, it is not clearly defined about the expected contribution of each of above government bodies and their required internal policies to support the SLSEA activities. This wide representation ensures linkages with different ministries and government organizations required for renewable energy sector development. Currently there is no specific master plan for biomass energy sector development



2-6. Contribution of PUCSL

The PUCSL was established by the act number 35 of 2002 by the parliament of Sri Lanka as a multi-sector regulator to regulate certain physical infrastructure industries in the country. It came into operation in mid 2003 with the appointment of the first group of Commissioners and its Director General. Initially this act is provided for regulation of the electricity and water service industries. Later, in March 2006, petroleum was also added to the list of industries to be regulated by the PUCSL.

The examination of national energy policy indicates that PUCSL has a key responsibility in the local energy sector. It is mandated to facilitate government energy policy directions. This includes promoting indigenous resources, adapting pricing policy, consumer protection in the energy sector, enhancing the quality of energy supply and protecting against adverse environmental impacts.

A rationally structured development plan is needed for developing biomass-based renewable energy sector of Sri Lanka. Demand and

3.Recommendations to develop a National Policy Framework

A biomass energy sector development plan should be supported by appropriate national energy policies. It is also needed to change institutional policies of government institutes which have direct linkage for supporting this sector. Further, it is also required to identify rules and regulations of the country which may act as barriers for developing this sector. Some of the policy and implementation elements required in the national energy policies and strategies for the development of the biomass sector are as follows

(A): Biomass energy resources are explored to ensure energy security

It is necessary to carry out resource and demand mapping to quantify resource availability and increase the efficiency of the biomass supply chain. The SLSEA is responsible to collect necessary data and carry out renewable energy resource planning and assessments. Although SLSEA is responsible for collecting required data, there are several government

organizations that should be responsible for providing relevant data. This includes Ministry of Agriculture (Agro forestry information)/Institute of Post Harvest Technology, Ministry of Land and Land Development, Ministry of Forestry (Forest/renewable forest/marginal land plantation/monoculture plantation), local government bodies (information about biomass from residues and waste), Ministry of Industries and Ministry of Power and Energy. However, examination of internal policies and operational objectives of organizations relevant to the above ministries suggest that, there are no specifically targeted activities to provide necessary data to SLSEA. Therefore, it is necessary to change the institutional policies of the above ministries and institutions to facilitate SLSEA activities.

(B): Biomass energy consumer protection

Lack of well organized biomass supply chains are one of a main barriers for developing a biomass-based energy sector in Sri Lanka. Therefore, it is essential for the government to strengthen biomass supply chains and protect consumers. Decentralization of present SLSEA activities, involvement of local government bodies and development of coordination agencies in many parts of the country to facilitate the biomass sector are necessary.

(C): Enhancing biomass energy production

To promote commercial fuelwood plantations, incentive schemes should be introduced to encourage agro-forestry and institutional development. The local governmental institutions should facilitate biomass energy sector development. Integration of forest-related institutions and development of a network of information infrastructure to transfer, develop and retain technological know-how are some necessary implementation activities required to enhance biomass energy production.

Changes to current legislation are also needed to enhance biomass production and utilization. Land Ordinance No: 8 of 1947 and National Forest Ordinance No.56 of 1979 etc need some amendments to facilitate the biomass energy sector development while Government Gazette Extra Ordinary No. 1380/30 of 18th February 2005 and cabinet paper – 05/0914/021/035 of 30th June 2006 are some important government policy documents that affect the biomass sector.



(D): Promoting biomass energy technologies

There are many institutions engaged in research & development and technology transfer. Most are operated under Ministry of Science and Technology in addition to the universities. The research should positively contribute to local technological developments including biomass energy technologies (BET). Currently their contribution to the BET development and transfer is low. Researches should be proactive and research institutions should adopt policies in favour of local value addition to the technologies that use indigenous resources such as biomass. They should define their contribution to biomass-

related technology development and transfer. As an internal policy, they can allocate a specific percentage of their budget for bioenergy sector development related activities each year.

(E): Adopting an appropriate pricing policy

A main barrier to biomass energy sector development is the fluctuation and uncertainties of fossil fuel prices. It is important to have a suitable pricing formula for biomass to protect both suppliers and consumers. The SLSEA and PUCSL could act as the responsible organizations. Market norms on competitive pricing have to be developed in an open economic environment.

(F): Boost biomass energy utilization

It is needed to promote the use of improved biomass energy for both domestic and industrial applications. The immediate implementation activity for this task is to carry out promotion programs to encourage biomass utilization in more efficient appliances. Commercial development of biomass has to be encouraged and facilitated as a rural industry. The investment risk for shifting to biomass for energy generation has to be minimized. SLSEA is responsible to provide technical guidance & support to biomass energy projects and carry out R & D to minimize indoor air pollution. PISCES Project works on this respect with the SLSEA.

Although SLSEA has the responsibility to promote renewable energy, the expected contribution is not clearly defined in its act. Some NGOs work on these subject areas and SLSEA could work with them

(G): Promoting biomass energy sector investments

Presently, the biomass-related energy sector lacks required investments. The investors have problems in finding available financial resources since most of the lending institutions are reluctant to support the sector. Perceived financial risk due to lack of reliable biomass supply appears to be the main factor affecting this situation. Therefore, government direct investments or incentives to the private sector investors are essential to develop the biomass energy sector

by Practical Action



BEASL Proposed Agricultural Project on Gliricidia in Galle

Gliricidia tree is popularly known as Ginisiriya, Makulatha and Wetahiriya, etc in villages. Gliricidia Sepium producing pink coloured flowers is the most widespread type found in Sri Lanka. Apart from main uses as fuel, Fodder and Fertilizers there are several other uses. The writer through Galle District Chamber of Commerce and Industries had forwarded two separate project reports to Director – Planning, District Secretariat, Galle on -

- Potential availability of Gliricidia leaves in Galle district.
- Gliricidia based furnace for the tea industry

The guidance and relevant data for these reports were obtained from BEASL and GLIDE [Pvt] Ltd. The Director – Planning, District Secretariat, Galle had sent these reports to Ministry of Agriculture and Agrarian Services, Battaramulla. Several presentations were made by Mr. L.P. Jayasinghe, President BEASL at Galle District Chamber of Commerce and Industries and District Secretariat, Galle focusing on potential value of Gliricidia and its uses.

A] Potential availability of Gliricidia leaves [in Galle district].

i) Yield [leaves].

Pruning height is 1.5 meters above ground except as support tree for black pepper.

First harvest 1-1 ½ years after planting

Average yield of fresh leaves 5kg / tree / year (in two prunings)

ii) Potential yield of Gliricidia leaves (per year):

Yield from home gardens 1,700,000 kgs.

Yield from inter crop under coconut 150,000 kgs.

Yield from shade trees in tea lands 3,700,000 kgs.

Yield from support tree for black pepper 4,402,500 kgs.

Total fresh leaves 10,000 M.Tons / year.

Total dried leaves 2,500 M.Tons / year.

Average dried leaves per month 200 M.Tons.

(By arranging monthly harvesting system spreaded over 12 months)

B] Gliricidia based furnace for the tea industry [in Galle district].

The writer has found that one of the main factors discouraging people to grow Gliricidia was there is no proper and assured channel to dispose or market the stem / wood (as leaves could be dried / processed or incorporated to soil). In this connection, with assistance from GLIDE [Pvt] Ltd, a proposal was submitted to use chopped Gliricidia wood to provide thermal energy for tea industry. As there is a scarcity of rubber wood, there is good scope – if people are encouraged to grow Gliricidia, wherever possible to ensure uninterrupted supply to tea factories.

i) Yield [wood]

wood yield from matured tree (after 3 years) 4 kg / tree / year.

ii) Potential yield of Gliricidia wood per year

o Yield from home gardens 1,360,000 kgs.

o Yield from inter crop under coconut 120,000 kgs.

o Yield from shade trees in tea lands 2,960,000 kgs.

o Yield from support tree for black pepper 3,570,000 kgs.

Total yield 8,010,000 kgs.

= 8,010 M.Ton per year

iii) a) Fuel wood consumption in tea

Type of wood	Fuel wood consumption @ 15 % moisture	Made Tea	Fuel wood consumption Per kg of made Tea
Rubber wood logs	1068 kgs	445 kgs	2.41
Gliricidia (chopped)	753 kgs	572 kgs	1.32

(Please note above rates are area specific)

b) Fuel wood cost per kg of made Tea

Type of wood	Rate (Rs)
Rubber wood logs	12.50
Gliricidia (chopped)	6.00

Other advantages are –

Reduction of warming period

Improvement of quality of made Tea fetching higher prices at auction.
(however this area is still under study)

C] Role of Galle district Chamber of commerce and Industries

The main areas involved are –

- o Organizing collectors and processors of Green leaves.
 - o Organizing suppliers of chopped Gliricidia wood to factories.
 - o Organizing transport agents for raw materials.
- Thus providing employment at rural level.

D] Strategy

It is necessary to create awareness of the crop and its potential benefits.

It is suggested to establish demonstration plots (01 acre in extent) under coconut at selected division secretary divisions in Galle. Suppliers of dried processed leaves and chopped wood and transport agents have to be organized by Galle district Chamber of commerce and Industries.

Lands for demonstration projects to be selected by field officers of Dept. of Agriculture, Dept. of Agrarian Services and Coconut Cultivation Board, etc with the initiation of Director, Planning, District Secretariat, Galle and relevant Divisional Secretaries. Thus it is seen Gliricidia being a multipurpose tree and a money spinner has been neglected and confined to a fence due to lack of awareness of its potentiality

World is facing an energy crisis. fossil fuel would be available for another 50 years. hence time has come to focus on Bio mass energy, where there is negligible environmental pollution.

by L.L.Y Abeytunga.