Biomass Production in Sri Lanka and Possibilities for Agro-Forestry Intervention (Summary)

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Dr Gunathilaka's paper summarised the findings of a research project that was carried out over a period of five years commencing in 1998 on Sustainable Supply of fuel wood to meet Sri Lanka's energy needs by four institutions, jointly by the Ministry of Science and Technology, Natural Resources Institute of the University of Greenwich, U.K., Department of Forestry, Coconut Research Institute (CRI) and the Land Use Policy Planning Division. The project had the two short term objectives.

1. To demonstrate the technical feasibility of short-rotation fuel wood plantations, particularly on degraded lands, as sources of energy for Sri Lanka and
2. Enhance institutional capacity in Sri Lanka in the knowledge of fuel wood as a source of energy.

The project set out to determine, the growth and performance for well known fuelwood species using a range of spacings and different harvesting techniques. Although overall some 14 species were included, the emphasis was placed on the key species of *Gliricidia sepium, Acacia auriculiformis* and *Leucaena leucocephala*. A split-plot design was adopted for the plantation trials to provide replications of species, spacing and harvesting regimes. The interventions for establishment were envisaged to be three species (as above) two spacings, (S1:1m x 2m and S2:1m x 1m) and two harvesting regimes (H1:annual coppicing roughly at a height of 1m and H2:continuous harvesting-removing branch materials as it reached a base diameter of 25mm , cutting at a height above 1.5m on the main stem)

The results on the growth and yield were compared with the similar trials performed under coconut at the CRI. Both *Gliricidia* and *Acacia* performed well in a wide range of sites over *Leucaena.* However, *Gliricidia* was the best in many locations due to high wood yield, high rate of leaf decomposition, tolerance to frequent harvesting, less mortality, easy establishment with sticks, easy handling due to appropriate size of branching and multiple use (e.g. feeding for cattle etc).

Comparing the two espacements; planting *Gliricidia* at 1m x 1m (10,000 trees/ha) appeared to be preferable to 1 x 2 m spacing (5,000/ha). Planting at the closer espacement led to an expected improvement in the suppression of weeds in the initial years of establishment together with the development of straighter shoots. However where the tree crop is being grown as a pure crop at the close espacement and not in combination with an overstorey of coconut, then for ease of harvesting a gap of 4m is required for every 12 rows of trees. This leads to an effective density of 5,625 trees per hectare.

Considering the two harvesting regimes tested, annual cropping (cutting of all branches at the same time) at a height of 1m produced the highest yield in the long run. Trials in many locations together with the demonstration areas at CRI suggested that a harvesting interval of eight months could be adopted to optimise leaf and wood yield particularly from *Gliricidia.*

In terms of energy production, wood yield is of course the most important concern. A mean wood yield of 24.0 metric tonne per ha (at 20% moisture level) was obtained from *Gliricidia* in additional to a foliage yield of 24.0 metric tonne per ha (fresh weight basis). At the third year after planting, *Gliricidia* was able to demonstrate a positive cash flow and by the fifth year, *Gliricidia* inter-cropped with coconut generated Rs. 35,400 per year as net profit.

Parallel studies conducted at the CRI (in the two locations of Pallama and Rathmalagara) showed that inter-cultivation of *Gliricidia* within coconut improved the micro climate i.e. there was a reduction of soil temperature coupled with an improvement in soil moisture compared to a pure crop of coconut. Considering the issue of soil fertility, the nutrition of coconut palms was increased by its association with *Gliricidia* especially with respect to nitrogen. With the exception of Potassium, other plant nutrients such as P, Ca and Mg levels were also improved as a result of the inter-cropping. The deep root system of *Gliricidia* appears to have the effect of mining nutrients from the deeper soil layers to and returning them to the upper layers through the process of pruning and decomposition of the foliage.

Assessment of the real economic value of *Gliricidia* cultivation requires further extensive study. Fuelwood generates additional income through the generation of power and energy, but additional benefits and income are possible through the silvi-pastoral systems where the foliage is used to supplement cattle feed. Such an integrated system generates milk, compost for farming and the generation of bio-gas. Based on present market values, this system has the potential to generate over Rs.220,000 per ha/year.

Based on the impressive results of the trials, two demonstration facilities to convert fuelwood into heat and electricity were established by the Ministry of Science and Technology. These demonstration units have resulted in the encouragement of many farmers taking up fuelwood.

The Government of Sri Lanka has taken the following steps to promote the growing and utilization of fuelwood:

- An Inter Ministerial Working Committee was established to identify the issues to be addressed to promote the growing and utilization biomass fuels. This Committee has submitted its final report. The Government is in the process of implementing the recommendations of this committee.
- The Ministry of plantation Industries has decided to support and promote fuelwood crops by including *Gliricidia* as the fourth major plantation crop under the ministry.
- The Coconut Cultivation Board has decided to give a subsidy of Rs.7,500 per ha for inter-planting *Gliricidia* in coconut lands.
- Further, the Coconut Development Authority has initiated action to support the use of SRC wood as a fuel for the desiccated coconut industry.