USES AND MANAGEMENT OF NITROGEN FIXING TREES IN COCONUT PLANTATIONS

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Low productivity and poor returns from a unit of coconut land coupled with price instability of the coconut crop have threatened the sustainability of coconut plantations in Sri Lanka. Over the past three decades, coconut-based farming systems have been introduced by the CRI, for the purpose of increasing land productivity and generating additional income to the coconut farmer.

On fertile soils with favourable climate, farmers are encouraged to grow high value cash crops with a ready market such as Pineapple, Banana, Pepper, Ginger, Betel, Cinnamon etc. Nitrogen Fixing Tree (NFT) species have been introduced to areas where these cash crops will not perform well especially on degraded marginal land with less favourable climate such as those in the intermediate and dry zone.(mainly land suitability classes 4 and 5)

Since 1987, CRI has attempted to grow several nitrogen fixing trees (NFT s) such as *Gliricidia sepium, Calliandra callothyrsus, Leucaena leucocephala and Acacia auriculiformis,* with the main objective of utilizing such marginal coconut land with moderate rainfall to increase productivity and accrue several benefits to the farmer.

Figure 1.Gliricidia cultivated in between coconut rows

Factors to be considered in selecting NFT s

* Compatibility with coconut
* Tolerance to partial shade
* Ability to grow on degraded soils
* Optimum biomass production under coconut shade
* Ability to withstand repeated pruning
* Good coppicing ability
* Use minimum external inputs (eg. fertilizer, pesticides)

*** Compatibility with coconut**

The effect of fast growing tree species on coconut yield is an important aspect to be considered in promoting their adoption in coconut plantations. Data collected over five years have revealed that despite non application of fertilizer and water to NFT s, there was no detrimental effect on the palm, compared to control blocks. Among species, all except Leucaena showed an improvement in the yield of coconut in the range of 15-20%.

*** Tolerance to partial shade**

It has been shown that among NFT s the least reduction of biomass yield under reduced light occurred in Gliricidia (23%) followed by Calliandra whereas biomass of Leucaena was reduced most (56%) by low light, suggesting that it is less shade tolerant. Of all NFT species, Gliricidia has shown to be the most compatible species that could be grown in association with coconut.

*** Optimum biomass production under coconut shade**

Optimum biomass production can be achieved by tree management. Frequency and height of pruning are important aspects in tree management.

Experience has shown that highest biomass productivity in NFT s could be achieved by pruning trees 1.0 m above ground at 3-4 monthly intervals. For instance,gliricidia is capable of producing 10-15 mt of fresh loppings per year from one hectare of coconut land.

*** Ability to grow on degraded land**

NFT species have established well and continue to produce satisfactory biomass without fertilizer on Andigama soil series which is considered marginal for coconut due to poor physical characteristics of the soil.

Figure 2.Use of Gliricidia leaves as green manure

*** Use of minimum external inputs**

This is a clear advantage of NFT s as other crops will not perform well without the application of fertilizer and pesticides. These trees have the ability to meet their own nutrient requirement by foraging through the soil profile, biological nitrogen fixation and they

are practically free of pests and diseases.

*** Ability to withstand repeated pruning**

Despite NFT species have been subjected to pruning 3-4 times a year and this process has been repeated for five consecutive years,trees continue to perform well and remain productive over the years.

*** Coppicing ability**

The ability of NFT s to produce new shoots after each pruning is referred to as coppicing ability. All NFT s have shown their ability to produce coppice shoots after pruning. Among NFT species, Gliricidia, Calliandra and Acacia have shown better coppicing ability.

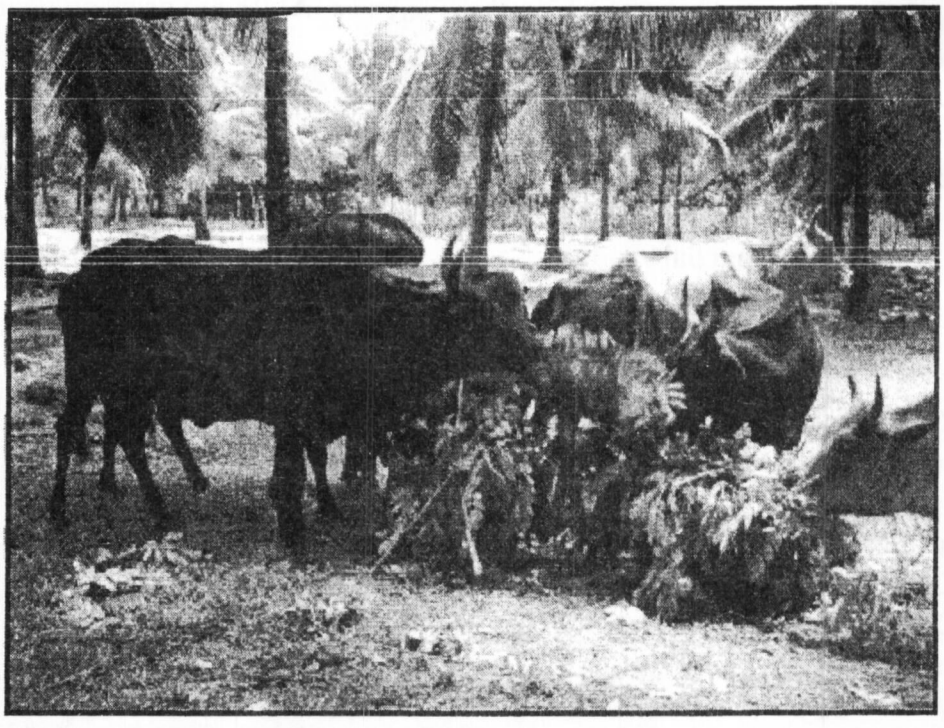

Figure 3.Gliricidia foliage as animal fodder

ROLE OF NFT' S IN COCONUT PLANTATIONS

*** Use of fresh biomass as green manure**

Of the NFT species, Gliricidia and Leucaena foliage is particularly rich in nitrogen. It has been shown that application of 35 kg fresh Gliricidia loppings could satisfy the total requirement of N and at least 20% of P and K requirement of the coconut palm, thus providing about 40% saving on the cost of fertilizer. It will also provide a regular supply of micronutrients to the palm.

*** Use of fresh biomass as mulch**

Of the NFTs, prunings of Acacia followed by Calliandra have shown a greater promise to serve as a surface mulch. With all species, mulching has shown a better effect against bare soil, in terms of moisture conservation ability, soil temperature regulation, and weed suppression.

*** Use of fresh biomass as animal fodder**

Mixing of poor quality grass or rice straw with Gliricidia and Leucaena foliage up to about 30% of the total feed will provide a balanced ratio for livestock, especially dur-

ing the dry period. Feeding with high protein supplements has given rise to improved intake, better digestibility and weight gains of ruminant livestock. Acacia leaf is commonly fed to goats.

*** Restore and improve soil fertility**

NFT species have a special ability to grow on marginal lands and improve soil physical, chemical and biological properties, there by improving the productivity of soil and facilitating better growth and yield of coconut palms.

*** Use of NFT's as temporary shade**

In new plantations, species like Gliricidia and Leucaena have been grown together with coconut seedlings to provide temporary shade,especially in dry areas to provide a favourable microclimate for initial establishment and growth up to about 3 years from planting.

*** Use of NFT's as live support**

Of the NFT's Gliricidia is widely used as a live support for Pepper and Vanilla grown together with coconut. Application of Glricidia loppings arround Pepper could reduce the fertilizer requirement of Pepper by about 50%.

Considering the easy management and the potential use of NFT's, it is profitable to grow them, especially on marginal coconut lands.

Specialist Assistance to Develop your Plantation

The Coconut Research Institute implements programme known as "Persuasive Extension Programme" to assist coconut growers to develop their plantations with the adoption of new technology. In this programme a group of scientists and extensionists of the Institute meet land owners in their plantations and draw up suitable development plans in consultation with land owners. In this exercise land owners have an opportunity to discuss their problems and limitations and decide on future development activities. Officers from this institute continue to assist them in the implementation of the proposed development plan and monitor the progress. This is a valuable opportunity for growers who wish to improve the productivity of their plantations.

If you wish to register to obtain this service, please write to ***Director, Coconut Research Institute, Lunuwila, Sri Lanka.***