

RESULTS OF SILVOPASTORAL SYSTEMS PROJECT IN THE HUMID TROPICS OF COSTA RICA.

M. Ibrahim

Over the past decades the humid tropics of Costa Rica had been deforested mainly for cattle ranching. The dominant feature of pastures established after forest clearing is pasture degradation, this being the main factor contributing to the low biological and economic efficiency of cattle production in Costa Rica and in Latin America. About 77% of the total area under pasture in the humid tropics of Costa Rica is dominated by very unproductive naturalised grasses, the main species being ratana (*Ischaemum ciliare*), carpet grass (*Axonopus compressus*) and *Paspalum spp.*

Between 1985 and 1994, the Silvopastoral project at CATIE (funded by IDRC, Canada) conducted research in the zones of Guapiles, Perez Zeladon and Turrialba, to develop improved low input technologies for increased and sustainable livestock production in the humid tropics. The first phase of the project (4 years) studied: selection and management of improved forage germplasm, stability and productivity of grass legume mixtures, management of trees (*Gliricidia sepium* and *Erythrina berteroana* etc.) for protein banks and living fences; methods of establishment of trees in pastures and soil fertility improvement in Silvopastoral systems. In the second phase of the project, research was carried out on: the use of legume tree foliage to supplement low quality feeds and validation of improved technologies on farms.

The results showed that improved grasses (*Brachiaria brizantha* and *B. humidicola*) and legumes (*Arachis pintoi*) produced up to 30 tons DM/ha/year and liveweight gains on these pastures were five times greater than those obtained under traditional pasture systems in the humid tropics. This means that livestock production can be intensified and therefore fragile areas can be released for reforestation.

Living fences of *Erythrina* and *Gliricidia*, managed with three prunings/year, produced a significant amount of feed (2.4 kg DM/tree/year) that was of high nutritive value (IVDMD = 60%; CP = 23%). Milk yields and liveweight gains of animals grazing unimproved pastures were increased significantly with the supplementation of foliage from these tree species.

The introduction of leguminous trees in grazed pastures showed improvements in soil fertility, in particular available soil nitrogen and phosphorus. N concentration of soil increased by 0.04% after 3 years of grazing. Apart from this, organic carbon was increased significantly (3 tons/ha/year), demonstrating the role that silvopastoral systems have in carbon sink storage.

On farm results showed that milk yields were increased by 1-2 l/cow/day with supplementation of poro (*Erythrina*) in the period of low rainfall (Dec. - April) when there is a deficit in forage supply because of a moisture deficit in these rapidly draining soils. This permitted a reduction in the amount of concentrates used to supplement dairy cows.

From the above results, it is concluded that improved silvopastoral technologies offer alternatives for increasing the economic efficiency of livestock production in the Atlantic zone. However there is need to strengthen research in the following areas:

- Restoration of degraded pastures (process of degradation and methods for restoration of degraded pastures).
- Competition of trees and grasses or legumes in a pasture system.
- Grazing management of forest or perennial (fruits, oil palm etc.) plantations.
- Grazing or browsing management of tree or shrub species.
- Environmental effects on forage quality.
- Use of tree or shrub species for feeding animals in the seasonally dry areas (Pacific watersheds of Central America).
- Nutrient cycling in silvopastoral systems.