Benefits of Para Rubber Forest Garden System

"Rubber Forest Gardening" is a sustainable system of rubber cultivation that provides for continual utilization of the land at its highest efficiency. It is environmental friendly. It produces a lot of biomass. It includes both cultivation of plants and animal husbandry. The plant and animal varieties included in a garden depend primarily upon the interests of the farmer and the climate and conditions of the land thus to develop economic, ecological, and social sustainability and food security.

In summary the results of the comparative study of sustainability in 3 perspectives between rubber forest garden systems and rubber monocultures in the provinces of Songkhla, Phatthalung, and Trang comparing 6 farm pairs, with each pair of farms located close by to each other, and generally with rubber trees of similar age, with the 6 rubber forest gardens having trees of an average age of 28 years and with the 6 rubber monoculture farms having trees with an average age of 20 years.

1 Economic Perspective

For this perspective alone data was used from 5 rubber forest gardens (average tree age of 24.4 years) as the 6th garden has rubber trees of 46 years of age where the garden was allowed to return to a natural forest state, and where there are no management costs for this garden.

1) Quantity of fresh rubber latex

Rubber forest garden systems yield on average 5.39 kgs/ rai/ day* similar to rubber monocultures with a yield on average of 5.09 kgs/ rai/ day*

2) Density of the fresh rubber latex

Rubber forest garden systems (33.79 %) similar to rubber monocultures (34.58%)

3) Quantity of dry rubber latex

Rubber forest garden systems yield on average 1.71 kgs/ rai/ day* similar to rubber monocultures with an average yield of 1.77 kgs/ rai/ day*

4) Earnings from fresh latex/ latex sheets

Rubber forest garden systems earn 136.96 baht/ rai/ day* similar to rubber monocultures with an income of 141.87 baht/ rai/ day* (based on buying price of 80 baht/ kg from Nov 2012- October 2013)

5) Expenses (Including labor and fuel for vehicles)

Rubber forest garden systems have average expenses of 27.24 THB /rai / day, similar to rubber monocultures with expenses of 27.74 THB /rai / day

6) Expenses (Not including labor and fuel for vehicles)

Rubber forest garden systems have average expenses of 8.54 THB /rai / day, similar to rubber monocultures 8.71 THB /rai / day

7) Earnings from other crops in the forest garden

Rubber forest garden systems earn an average of 7.73 THB/ rai/ day from other crops in the garden. (*This covers only regular produce yields not longterm yields such as integrated hardwoods that might be harvested at 20 years or more.)

8) Expenses from other crops in the forest garden

Rubber forest garden systems have average expenses for other integrated crops of 1 THB/ rai/ day

*Note points: 1-8 come from real data recorded by the farmers each day they tapped rubber and collected fruits or other produce from integrated crops over a 1 year period from Nov 2012- October 2013. Southern Thailand averages 120- 140 tapping days per year. 6.25 rai = 1 hectare.

2 Environmental Perspective

1) Forest Canopy Levels

Rubber forest garden systems have 3 levels of canopy as follows:

- Peak canopy - being rubber trees
- Mid-level canopy - including agarwood, Hopea odoata, Dipterocarpus alatus, Michelia champaca L., Hooker's fishtail palm, Syzygium grande, Garcinia merguensis
- Lower-level canopy- (counting all plants) including seedlings, 28- 53 different species per rai (6.25 rai = 1 hectare) in total 1,938- 3,294 plants/ rai more than found in rubber monocultures which have only one canopy level being rubber trees.

2) Use / Benefits

Rubber forest garden systems have a diversity of species and a high number of both cultivated and wild plants, these provide benefits both in terms of natural capital and for different human uses as follows:
(connects with 1)

- Economic species such as rubber, fishtail palm, champada
- Lumber species such as Hopea odorata, Dipterocarpus alatus, Mesua ferrea
- Herbs such as galanga, bandicoot berry, toothbrush tree, Myxopyrum smilacifolium
- Fuelwood species such as Elephant apple, Barringtonia acutangula,Weeping fig, Antidesma bunius L.
- Seasonal fruits/ fodder for wildlife such as figs, santol, etc

In addition, seedlings can be transplanted to increase the diversity of the rubber forest garden and sold as an additional income

3) Percent of canopy cover

Rubber forest garden systems have a canopy cover of over 80% which helps to conserve topsoil and water better than rubber monocultures which have a canopy cover of less than 65%

4) Tree biodiversity

1 Rai of rubber forest garden has 6- 20 different species of trees with a diameter of at least 1 cm at chest height intentional planted or that have come naturally with a density of 158- 319 trees/ rai (6.25 rai = 1 hectare)

5) Carbon dioxide absorption and sequestration

Rubber forest garden systems can sequester 28.80 tons/ rai of carbon by the time the rubber trees are 20 years of age and other trees are 5- 13 years (This considers above ground and below ground carbon) and the rate of sequestration increases from there by at least 15% per year. The trees absorb and sequester the carbon in their wood, the rate increasing as the trees grow taller and bigger, thus helping to mitigate the global warming crisis. While from the research of Rawee Jiarawipha et al (2012) on carbon sequestration in rubber plantations (monoculture) found that carbon could be sequestrated at a maximum rate of 22.9 tons/ rai when trees are 26 years of age.

6) Soil Erosion

Rubber forest garden systems have 0.3 - 5 times less water flowing directly over topsoil than rubber monocultures (in some cases up to 10 times less) and water infiltration is 2-3 times on average that of rubber monocultures. This is because rubber forest gardens have many levels of canopy cover with many different shapes of leaves which help to slow the fall and flow of water to the ground. Aside from this the fallen leaves of the rubber trees and many other trees and plants in the forest garden cover the soil as a mulch helping absorb the rain and reducing the risk that rain drops will directly hit soil particles.

7) Soil moisture and surface temperature

Soil moisture and surface temperature are important factors effecting microorganism activity. Microorganisms work to break down organic material and convert it into nutrients to be cycled again back into the soil and plants. Rubber forest garden systems have an average soil moisture level 1.4% greater than that of rubber monocultures. At noon they have a soil surface temperature that is on average 2 degrees Celsius lower than in rubber monocultures and 33% higher relative humidity above the ground. This means that the rate of decomposition of leaves in rubber forest gardens is faster, and the rate of nutrient recycling is faster, more consistent, and greater than with rubber monocultures.

8) Amount of organic matter falling to the soil

The amount of organic matter falling to the soil in rubber forest gardens (leaves, branches, and other bits of plants and trees that fall to the ground) is 1.5 to 1.8 times as much as found with rubber monocultures (which only drop leaves, branches, etc of the rubber trees).

9) Decomposition of rubber trees leaves

Rubber forest garden systems have a rate of decomposition of the rubber tree leaves that is faster and more consistent than found in rubber monocultures.

10) Nutrient cycling

To produce 1000 kgs of latex, a rubber tree uses 20 kgs of Nitrogen, 25 kgs of Potassium, and 5 kgs each of Phosphorus and Calcium. A rubber forest garden system returns 1.4 to 1.7 times as much Nitrogen, Phosphorus, and Potassium to the soil from the organic material that falls to the ground. Therefore by integrating other trees and plants with the rubber trees, it increases the amount of nutrients being cycled and betters maintains the nutrient balance in the system. In addition the greater total canopy cover and multiple levels of canopy help to conserve the plant nutrients and prevent their loss from the ecosystem.

3 Social Perspective

A comparison of the sustainability of rubber forest garden systems with rubber monocultures was conducted using the Sustainable Livelihood Approach-SLA framework

Rubber forest gardens provide all of the following benefits to their garden owners

1. Financial capital- being economic earnings
2. Natural capital- being environmental benefits
3. Social capital as observed how these systems give inspiration and opportunity for those interested to learn the philosophy, techniques, and practices of rubber forest gardening. This has given birth to a network of persons interested to practice rubber forest gardening from diverse locations around the country
4. Human capital as observed in how the garden owners have knowledge and skill in garden management, and their good health from eating the chemical free produce of the many species integrated together with their rubber
5. Physical capital- which relates to access to resources and built infrastructure. No clear results were found.

This data is from the following research study:
A Comparative Study of Integrated Dimensions of Sustainability between Rubber Agroforests and Monocropping Rubber Plantations (2013-2014)

Power for Sustainable Future Foundation

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