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Analog forestry as an agroeological tool ensuring food security, biodiversity and climate resilience in Sri Lanka

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Sustainable Devopment Goals:

RAINFOREST RESCUE INTERNATIONAL (RRI) HAS BEEN IMPLEMENTING PROJECTS BASED ON NATURE CONSERVATION, ECOSYSTEM RESTORATION AND ORGANIC FARMING FOR MORE THAN 16 YEARS. THE GROUP PROMOTES ANALOG FORESTRY, AN AGROECOLOGICAL TOOL THAT ENCOURAGES BIODIVERSITY CONSERVATION AND SUSTAINABLE LIVELIHOODS. ANALOG FORESTRY RELIES ON PRINCIPLES OF ECOLOGICAL SUCCESSION, UTILISING ECOLOGICAL PROCESSES AND VALUING BIODIVERSITY, WHILE CONSIDERING THE EXISTING LANDSCAPE AND THE ECOSYSTEMS IN THE PARTICULAR TERRITORY. ANALOG FORESTRY CAN BE IMPLEMENTED IN DIFFERENT LAND FORMS, SUCH AS COMMUNITIES, FARMS OR HOME GARDENS. THROUGH ANALOG FORESTRY, RRI IS STRENGTHENING LOCAL COMMUNITIES BY ENSURING THEIR FOOD AND WATER SECURITY WHILE CONSERVING BIOLOGICAL DIVERSITY. RRI IS WORKING WITH WIDOWS IN SRI LANKA'S VAVNIYA DISTRICT TO IMPROVE THEIR LIVELIHOODS, AND ENHANCE BIODIVERSITY AND CLIMATE RESILIENCE THROUGH ANALOG FORESTRY PRACTICES.

A war widow harvesting coconuts in her analog forestry home garden. (Photo credit Lakshi Dilhari)

THE CHALLENGE OF DROUGHT, FLOODS AND DEFORESTATION

The northern dry zone of Sri Lanka is a largely agriculture-based area and home to about a third of Sri Lanka's population of about 21 million. The climate, which features one rainy season of four months and a long dry spell of eight months, makes farming difficult. Farmers must contend with flooding at the end of the rainy season and severe water shortages at the end of the dry season. Household incomes are around 10% lower in the dry zone than in other parts of the country. Deforestation is one of the most serious issues in Sri Lanka, which loses about one per cent of its forests each year.[1] The problem is mainly due to unsustainable development projects such as road and infrastructure development, and land encroachments for commercial cultivation (e.g. tea, palm oil). As a result of deforestation, a considerable number of natural habitats, faunal and floral species, and different ecosystems are gradually disappearing. With regard to the 1099 indigenous angiosperm species (flowering plants) assessed through the recent National Red Listing exercise, 675 species were found to be threatened, of which 412 (61 per cent) were endemics, and 37 per cent were Critically Endangered.[2] Significantly, a further 72 species (6.5 per cent) had already become extinct. The dipterocarps, with a remarkable endemicity of 100 per cent, comprised 6.5 per cent of the threatened plants in the list, with 42 threatened out of 58 species assessed, and one extinct species. Among fauna, 41 mammals, 46 bird species, 56 reptilians, 52 amphibian species and 28 freshwater species are under the threatened category.[3]

THE PRINCIPLES OF ANALOG FORESTRY

Analog forestry begins with an evaluation of the existing physiognomic structure of the original climax of a forest ecosystem. The gaps between the original forest ecosystem and the current structure are then identified to assess which species are missing from the plot. An ecological evaluation based on approaches like the Soil Foodweb determines the impacts of the land in three basic variables: soil quality, biodiversity and ecosystem structure.[4] During the ecological evaluation, RRI evaluates soil quality, including: physical components such as structure, texture, apparent density and infiltration; chemical components such as nutrients levels, soil PH, conductivity and organic matter content; and biological components such as soil biodiversity (e.g. earthworms, rate of residual, vegetation and decomposition).[5]
The land is then mapped out into two forms, one that includes topography and contours, and the other existing land use patterns with water streams, pasture, crops, forest, human settlement, etc. This helps to understand the state of the ecosystem, its characteristics and geographical positioning for development of an integrated land design. The basic design of the AF model includes three steps related to the selection of species, soil improvement and management activities. Species are selected to add a missing structural component in the system, eventually improving healthiness, growth, production, economic value, lignification and overall ecological services to the environment.[6]

One of the basic concerns of analog forestry is restoration of degraded lands. After evaluating the soil, the group takes several measures to accelerate the soil enrichment process, including by adding organic matter through mulching, use of green manure and the planting of hedgerows with suitable species on contour lines. An analog forest follows four major stages of ecological succession. At each level of succession, a roughly equal level of species is maintained. In the pioneer stages, to help increase diversity and productivity, RRI uses annual crops such as cereals, beans, squashes. In the later seral stages, perennials such as coffee and fruit are used. At the climax stage, the particular territory will be an ecosystem with a complexity comparable to a natural climax forest, including abundance of species diversity and complex interaction between biotic and abiotic components ensuring ecological and economic values (Figure 3).

DEVELOPMENT OF HOME GARDENS BASED ON ANALOG FORESTRY

The northern dry zone region is home to high number of war widows due to the country's 30-year-long civil war.[7] For six years, RRI has been working with 150 war-affected widows to address some of the challenges they face, including the need for steady income generation and climate resilience, by creating home gardens based on the principles of analog forestry.

The gardens produce marketable fruits, medicines, spices, tubers, cereals and vegetables which help the women earn a livelihood. Their products are mostly sold to the local market through community hubs, which have been initiated to improve market access. After four years, the women were able to harvest perennials in their analog forests. This, together with the produce from fruit trees, of which they have comparatively more than do conventional farmers, has enabled the women to earn more money than seasonal

crops. In addition to fresh fruit, the women are making dehydrated mango, jack fruit and pickles and jam, which are increasing in demand in the export market. Next to designing the gardens, RRI introduced analog forestry techniques and provides on-going guidance and support. Live fences around the farmers' lands provide compost materials and help reduce evaporation. The use of inorganic fertilizers such as pesticides, weedicides and insecticides has been replaced by analog forestry techniques. For example, if the fields are affected by different pests, RRI uses traditional pest control mechanisms (Kem methods, light and sticky traps) to avoid their spread.[8]

"Deforestation is one of the most serious issues in Sri Lanka, which loses about one per cent of its forests each year."

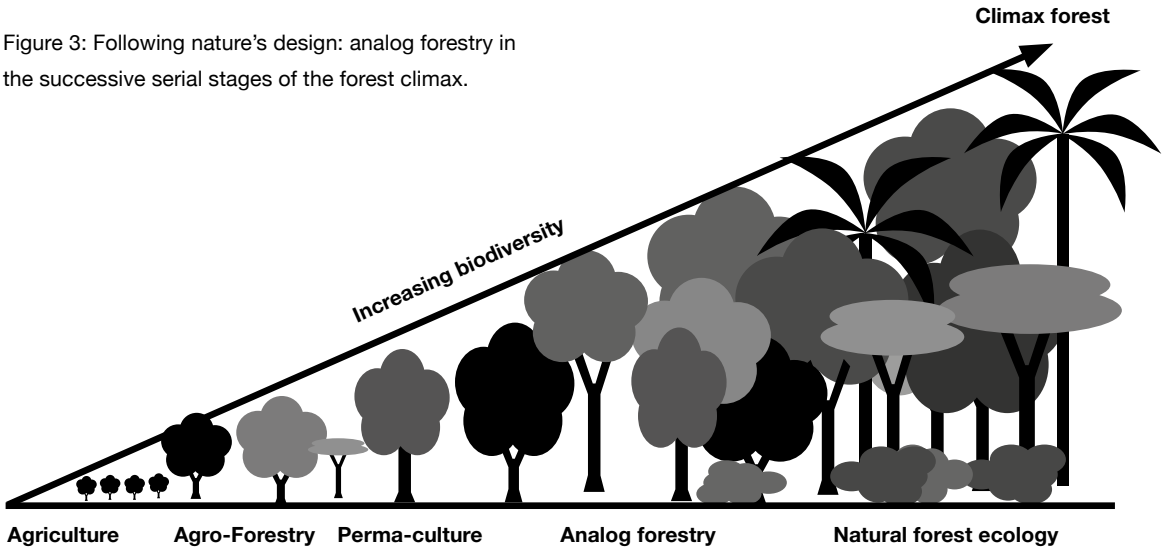
The women farmers have been trained in composting and mulching, and now use these techniques (e.g. wormy compost and liquid fertilizers) to enhance soil moisture content while also conserving soil. They are also generating additional income by selling excess compost. RRI has also established a community seed bank to enable farmers' self-sufficiency in heirloom seeds, which are vital for climate resilient farming.

Once the women started harvesting, RRI shifted its focus to post-harvest techniques, trainings on value addition and ensuring market links to increase farmers' income. By growing new crop varieties, the women farmers are linking to new and different local and international markets.

ANALOG FORESTRY AND SUSTAINABLE DEVELOPMENT

Analog forestry is contributing to various Sustainabel Development Goals (SDGs) in the northern part of Sri Lanka. A study analysing the benefits of home gardens (used interchangeably with analog forests) with regards to food security shows that home gardens in Sri Lanka provide farmers in general and widows in particular with additional food and income (SDG 1 and SDG 2) – they are "the poor farmers' insurance and safety-net in dire food situations, giving additional nutrition and calories".[9] Likewise, Analog Forestry is contributing to both climate change adaptation and mitigation (SDG 13). While the former is visible through the way Sri Lanka's home gardens/analog forests are efficiently and effectively made resilient to cope with climate change,[10] the latter is shown through the fact that analog forests store significant amounts of carbon.[11] Given that soil health is vital in analog forestry to provide macro and micro elements for new species to grow, big amounts of compost and mulch are being used through different techniques. Evaluating soil nutrients and other soil characteristics are considered crucial to identify the soil health. Finally, analog forestry is also increasing biodiversity by mimicking stratification of the natural forest and providing habitats for terrestrial fauna (SDG 15), something considered crucial given the alarming rates

Figure 3: Following nature's design: analog forestry in the successive serial stages of the forest climax.



of biodiversity loss in the country. Different species (trees for fruit and timber, shrubs, bushes, lianas, bromeliads and epypites) provide habitats and food for small mammals, reptiles, butterflies, as well as nesting and breeding places for birds. Land is restored through the use of plants with diverse growth forms and morphologies, including woody and non-woody plants, plants with deep rooted filtration plants, etc. RRI's efforts help to speed up the soil quality improvement process: organic matter is increased through mulching, use of cow dung and the planting of hedgerows on contour lines with different species. Drought tolerant crop species such as yams, fruit and perennials that grow in shade, help diminish problems caused by drought.

A TRADITION OF SUSTAINABLE AGRICULTURE

Sri Lanka has a rich history of sustainable agricultural practices. In ancient Sri Lanka, traditional farming systems included mix cropping, such as Kandyan forest gardens, Spice gardens and Ellanga systems.[12] Such practices provided income, while conserving water and biodiversity. RRI believes that there is much to be gained from documenting and reviving such practices. Despite the Ministry of Agriculture continuing to provide standardised tenure systems, hybridised seeds and fertilizer subsidies, different government institutes have started to engage in new research on organic farming practices, integrated crop management, and pest management to optimise yields. In addition, the national education system includes agriculture, agroforestry, and ecology aimed at enhancing the quality of sustainable farming while overcoming the issues regarding climate change, deforestation, resource depletion and other environmental issues.

However, RRI is concerned that the younger generation in Sri Lanka is struggling with modern technologies, and ignoring the ecological, spiritual and social values of the country. The group is also concerned about the lack of adequate policies and legislation around forest management in Sri Lanka. Therefore, the group is engaging in discussion with the government, advocating for more sustainable plantation management and implementation of policies to prevent deforestation, wildlife poaching, and biodiversity loss.

NOTES

1 Kariyawasam, R. & Rajapakse, C. (2014). Impact of Development on deforestation in Sri Lanka: An analytical study. *IOSR Journal of Environmental Science, Toxicology and Food Technology, 8* (7), 35-39. DOI: 10.9790/2402-08723539

2 Gunatilleke, N. (2008). Biodiversity of Sri Lanka. *Journal of the National Science Foundation of Sri Lanka, 36,* 25-62 DOI: 10.4038/jnsfsr.v36i0.8047

3 See 2

4 For more information on the Soil Foodweb Approach, visit: https://www.soilfoodweb.com/

5 International Analog Forestry Network (IAFN). (2012). *Analog Forestry: A Practitioner's Guide.* Retrieved from: http://www.analogforestry.org/wpsite/wp-content/uploads/2015/03/AF-Practitioners-Guide.pdf

6 See 5

7 Haynie, D. (2017). *Sri Lanka War Widows: The Women Left Behind.* Sri Lanka Brief. Retrieved from: http://srilankabrief.org/2017/05/sri-lanka-war-widows-the-women-left-behind/

8 Widanapathirana, C.U. & Dassanayake D.L.A.L.A. (2013). The Use Of Plant Parts In Pest Control Activities In Traditional Sri Lankan Agricultural Systems. *International Journal of Scientific & Technology Research 2,* 22-27.

9 Mattsson, E., Ostwald, M. & Nissanka, S.P. (2017). What is good about Sri Lankan homegardens with regards to food security? A synthesis of the current scientific knowledge of a multifunctional land-use system. *Agroforestry Systems, 92* (6), 1469–1484. DOI 10.1007/s10457-017-0093-6

10 Weerahewa, J. et al. (2012). Are Homegarden Ecosystems Resilient to Climate Change? An Analysis of the Adaptation Strategies of Homegardeners in Sri Lanka. *APN Science Bulletin, 2,* 22-27.

11 Mattsson, E. et al. (2013). Homegardens as a Multi-functional Land-Use Strategy in Sri Lanka with Focus on Carbon Sequestration. *Ambio 42,* (7), 892–902. DOI: 10.1007/s13280-013-0390-x

12 Pushpakumara, D.K.N.G. et al. (2012). A review research on homegardens in Sri Lanka: the status, importance and future perspective. *Tropical Agriculturist, 160,* 55-125.