

## ENVIRONMENT

## Tropical forests – the undernourished ecosystems

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**I**N THE world of ecology, tropical forests are hosts to a great level of biodiversity of both plants and animals.

However, in terms of the plants, biodiversity has nothing to do with nourishment as tropical forests are quite nutrient deficient ecosystems. The two main nutrients utilised by plants are nitrogen and phosphorous. The sources of these nutrients include both non-living (rocks) and living sources (such as organic matter found in plants and animals). Therefore it comes as no surprise that several biotic (living) and abiotic (non-living) factors affect the amount of nutrients and their locations in tropical forests. All of these points will be explained in the following paragraphs.

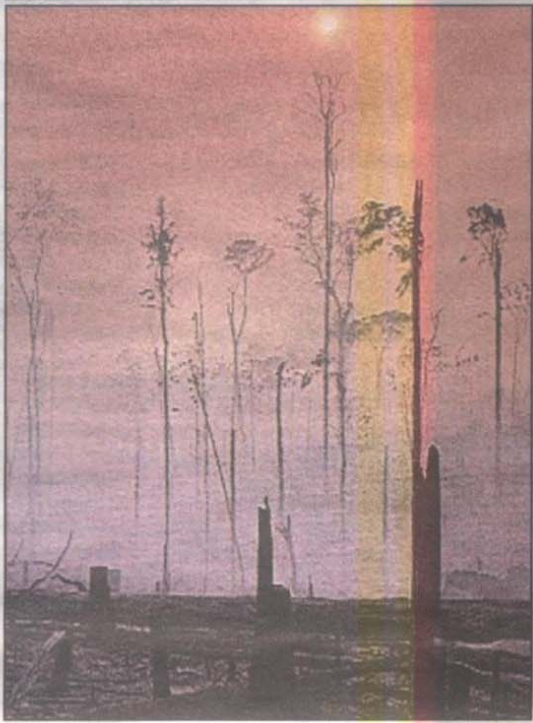
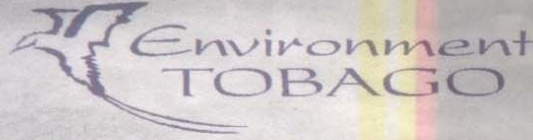
To first understand how nutrients are cycled in tropical forests, let's look at some abiotic factors. Firstly, temperatures- in the tropics it is relatively warm all year round, therefore the reactions that release nutrients occur at a faster rate. Secondly, Moisture which is trapped in the leaf litter is another important factor also present throughout the year. Moisture facilitates decomposition and the release of nutrients. Thirdly, Rainfall is an important factor as it allows nutrients to percolate into the soil. However, intense rainfall causes the nutrients to leech through the soil and be lost instead. High temperature and rain facilitate the weathering of rocks as they cause them to heat up and expand, while the rain causes cooling and contraction. Over time this continual expansion and contraction causes the rocks to crack and break up, the rain then dissolves the nutrients from the rocks which allows them to penetrate the soil.

However, despite the ideal conditions that provide the forest with a supply of nutrients, much of it is not kept in the soil but taken up by the plants and in turn by animals higher up in the food web, by herbivores and carnivores (biotic factors). Plants therefore, are in a constant battle to conserve the nutrients they have and take up as much as possible from the limited pool available. To counteract this, plants have devised mechanisms that allow them to conserve nutrients they uptake mainly in their leaves and roots.

Hence you would find that in regions that are poor in nutrients, plants tend to conserve their leaves, unlike nutrient rich soils which are favoured by deciduous tree species which shed their leaves periodically.

Other physical features developed by plants to conserve nutrients include developing thick leaves.

Other plant species develop leaves with drip tips which minimise the amount of time water stays on the leaves which in turn determines the amount of nutrients that are dissolved and removed when the water rolls off the leaf. Some plants may also produce toxic chemicals like phenols to prevent herbivory (insects and animals feed-



ing on leaves).

Rain is not the only way nutrients can be lost via leaves. Organisms regarded as epiphylls (plants that live on other plants, but do not take nutrients from their host plant); scavenge nutrients from the leaves by growing across their surface. For example, certain species of algae. However, the nutrients are not lost, as the algae will fall to the forest floor when it dies and will decompose, thus releasing the nutrients back to the soil.

As I mentioned previously, plants also conserve nutrients using their roots. This is done by having more roots usually concentrated close to the surface and the source of nutrients. Some plant species also use root decomposers like mycorrhizae (roots from fungi and algae) which increases the surface area of the roots, thus out competing the bacteria, which produce and take up nitrogen respectively. Some species also produce poison to get rid of bacteria that take up nitrogen.

For decades tropical forests have been a source of seemingly endless biodiversity as they just appear to produce a stream of new species. However, many may be under the misconception that this is due to ideal conditions in these habitats. But this is far from the truth, as we have seen in the case of nutrients. It just goes to show that how uniquely and diversely, these tropical species develop complex and specialised mechanisms of coping with a scarce commodity- Nutrients.

