

Soil and humus in tropical rainforests

Tropical rainforests grow in different soils. The nutrient-poor soils in the Amazon are the most well known. In order to grow, plants basically need carbon dioxide and oxygen from the air, water, and about 13 vital nutrients from the soil. The vital nutrients are divided into two groups: macronutrients, such as nitrogen, phosphorus, potassium, calcium, and magnesium, and micronutrients (trace elements), such as boron, cobalt, and molybdenum. Most tropical soils lack a few nutrients, most commonly phosphorus.

Why is the humus layer so thin in rainforests?

The seasons in the moderate latitudes prevent the decomposition process from taking place throughout the year, as it would under constant (ideal) conditions. In winter, nothing rots in the moderate latitudes; it is “break time,” because many small animals (such as earthworms, woodlice, and termites) and microorganisms (such as bacteria and fungi) are inactive at low temperatures. In this way, nutrient-rich soil develops over the course of time. Water-soluble nutrients are retained in the soil, where they can be absorbed by plants through their roots. The nutrient-rich humus layer is only a few millimeters thick in many tropical rainforests. In the tropics, organic material rots on the ground much faster than in the moderate latitudes because the temperatures remain consistently high throughout the year. As a result of the high temperatures and rainfall amounts, organic material on the ground is decomposed continuously and extremely quickly by small animals and microorganisms. There is no time for undecomposed organic material to build up on the forest floor, as occurs in the moderate latitudes in winter.



The photo shows a typical soil profile of the humid tropics, with a thin humus layer, a topsoil with lots of roots, and subsoil (mineral soil) underneath. The red color of the mineral soil indicates a high proportion of iron and aluminum oxides (laterite).

Comparison with nutrient-rich soils in Europe

In the moderate latitudes, the soils are rich in nutrients, and the excessive use of fertilizers in agriculture increases the nutrient content even more. This leads to higher productivity in the fields with less species diversity at the same time, in contrast to the soils in tropical rainforests, which have lower productivity (nutrient poverty) and wide species diversity. This already suggests why large areas of tropical rainforests must be cleared for agricultural use: The soils are very unproductive, which is compensated for by clearing large areas and using generous amounts of fertilizers – quantity instead of quality.