WHAT TYPES OF SOIL ARE THERE IN AMAZONIA?

Thin soils on the Andes Mountains

The rocks of the Andes Mountains are rich in plant nutrients, but soil erosion is so rapid in most areas that fine material is swept away soon after it is formed by weathering. In practically all areas there is only a thin layer of soils.

Only the varzeas have fertile alluvial soils.

On the flood plains of the Amazon River and the tributaries which come from the Andes Mountains, there are deep, fertile, clay soils. These have been formed from alluvium which is deposited there annually by floods. The poorly drained areas are commonly in pasture. Cropping is concentrated on the better drained areas, the higher banks parallel to the river courses.

Large areas of latosols

Both the higher terraces composed of the old lake bed, and most of the two shield regions, are covered by latosols which are very deeply weathered and infertile. The latosols, which cover 82% of the Amazon Basin, are very deep soils. Often there are 4-5 metres depth of clay overlying weathered rock or sedimentary deposits. The depth and structure of the soil provides good moisture storage. If the surface is protected from the sealing effect of raindrops, latosols are resistant to erosion.

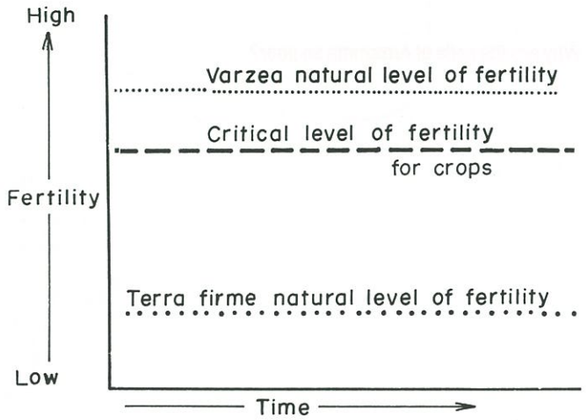
The main problem with latosols is their very low natural fertility. There are no longer any unweathered minerals which are likely to weather in the future, therefore there is no possibility of a release of nutrients from the soil itself. Many latosols have a high iron and aluminium content, caused by the dissolving of silica from the upper soil layers. The red latosols typically contain high amounts of iron, the yellow latosols rather less.

Both iron and aluminium reduce natural fertility. In the first case, iron locks up phosphorus by forming insoluble iron phosphates, and as a result the phosphorus is not available as a plant nutrient. High concentrations of aluminium tend to limit the growth of plants. Although most rain forest species seem to have adapted to this toxic effect, cultivated crops are susceptible to it.

Areas of tropical podsols

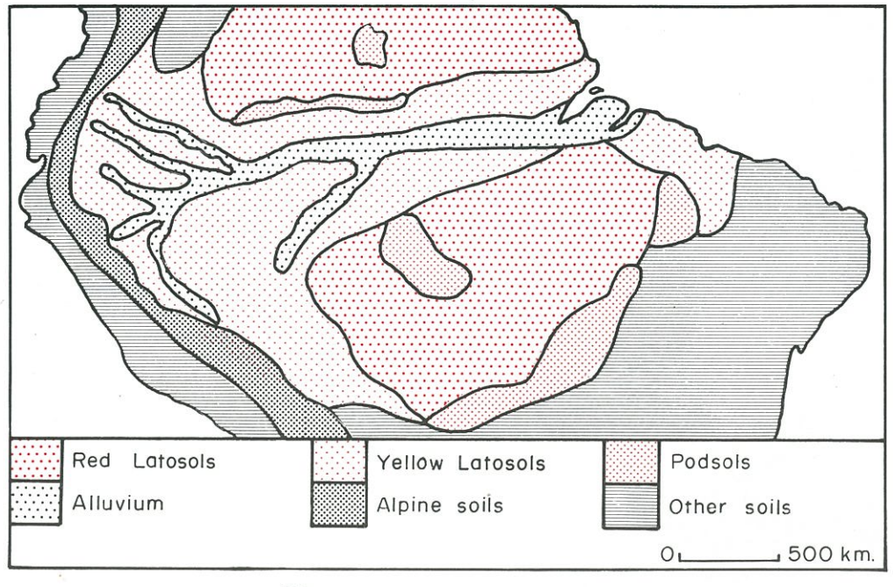
The pockets of sand deposits have sandy podsol soils. These are swampy in the wet season, but dry out very rapidly in the dry season. They are as infertile as the latosols, but because of their low moisture holding capacity, they carry only deciduous forest or savanna.

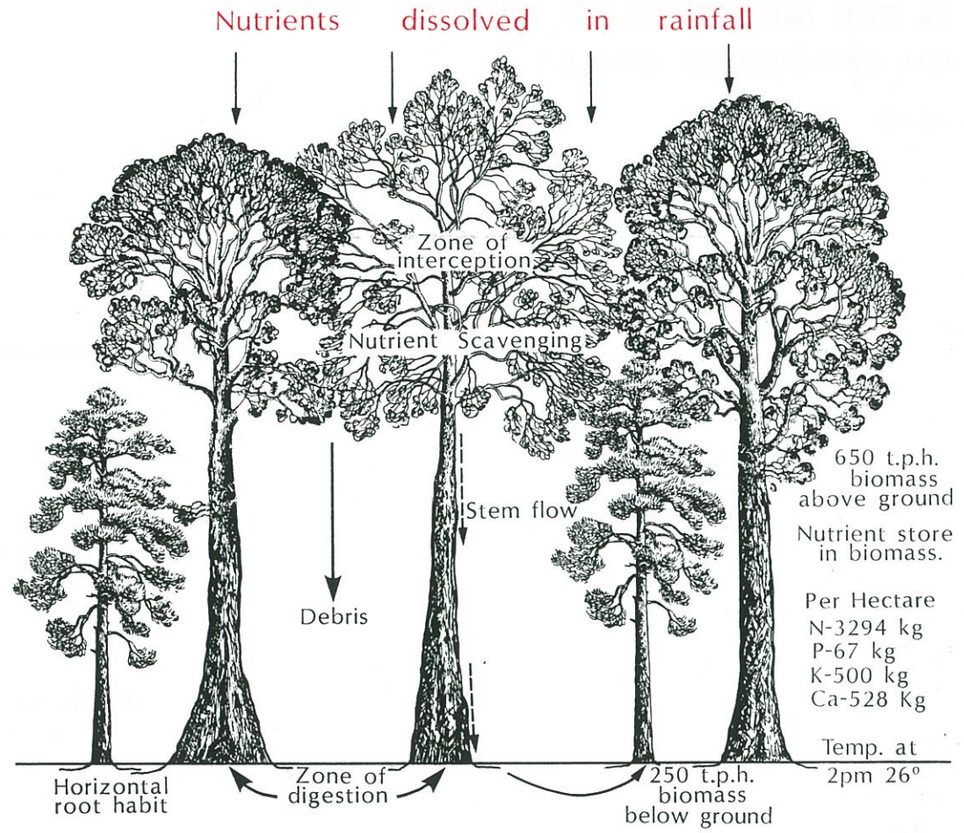
(a) Which two soil regions are linked by the processes of erosion and deposition which make one infertile and the other fertile?
(b) Which 3 geological regions are covered by latosols?
(c) List the advantages and the disadvantages of latosols.
(d) Name the poorest type of soil. Justify your choice.



Above: This graph shows, in general terms, how the natural fertility of the soil would match up to the needs of the typical crops of the region. Later in the book, there are other graphs which show how various techniques increase fertility to enable crops to be grown.

Below: Soils of Amazonia and the surrounding regions.



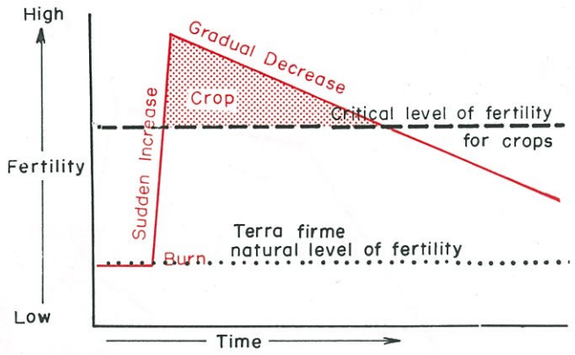


WHERE ARE THE PLANT NUTRIENTS WHICH SUPPORT THE FORESTS?

This diagram explains the circulation of nutrients which enable the forest to survive and reproduce itself. There is a constant circulation of nutrients between the forest and the forest floor, both in plant and animal debris and the movement of rainwater down the stems of the trees. The rainwater carries some nutrients which it collects from the dust and ash in the atmosphere. However, most of these water-borne nutrients are scavenged by the dense mass of leaves and epiphytes in the canopy.

When the debris falls to the surface of the soil it is rapidly decomposed and digested by bacteria, fungi and insects. In turn their remains are dissolved into the moisture which is taken up by the trees and transported back to the canopy. This nutrient cycle is practically closed, in that very little is lost to the subsoil or into the creeks.

The amount that is lost can be measured by comparing the nutrient content of rainwater and the water in streams. The latter is relatively pure, carrying neither eroded material nor dissolved nutrients. The forest maintains its nutrient supply within its own biomass, releasing only small amounts at any one time. Note that on the graphs the terra firme natural level of fertility refers to the soil itself, not to the total ecosystem.



Above: If a patch of forest is destroyed by burning, a large amount of nutrients will be released as ash. For a short time, the natural level of soil fertility will be increased to the level needed to support crops. However, as soon as the soil is used for cropping, much of the nutrient material will be used by the crops and some will be lost by leaching.

(a) Write 2-3 short paragraphs about one of these statements:
(i) "In Amazonia, vegetation has little influence on the soil. It is geological processes which determine soil fertility."
(ii) "The forests of Amazonia are self supporting. The soil merely provides a platform on which the trees stand."