Adaptations to soil & climate in a Biome | sample answer

Q: *'Describe how plant and animal life adapt to soil and climatic conditions in a biome which you have studied'* (2007 Q18)

3 Aspects will be discussed in this answer

1) Vegetation adaptation to climate: has adapted to climate by developing special characteristics in order to survive and grow in competition with each other.

Climate of the rainforest biome is equatorial. High temperatures all year average is around 27 degrees celsius. There are high levels of convectional rainfall (over 2000mm per year) and very little variation of season.

Climatic conditions allow a continuous growing season throughout the year for plants and trees. Because it is situated in the tropics it get 12 hours of sunshine a day. This allows a wide variety (+13000) of plant species to exist.

Different forest layers have developed- the forest floor, the understory, canopy and the emergent layer- as trees and plants compete for sunlight. This competition has led to many adaptations.

Emergent trees eg Mahogany grow tall (up to 30m) to reach the sunlight. They have tall, straight trunks which are branchless lower down and they grow at a good distance from one another to avoid competition.

Leaves of the trees in the canopy are thick and waxy to avoid transpiration due to the intense heat and have drip tips to allow abundant water to fall off them, thus avoiding breakage and mould.

Under the canopy there is little direct sunlight and plants have to adapt to this. They have very large leaves (up to 3x2m) to absorb any light getting through. An example is the Giant Taro or Elephant Ear plant.

Some plants are parasitic and use other plants to reach the light. Epiphytes on other trees, their roots absorb air and their leaves collect water (eg Bromeliads) whereas Lianas (vines or climbers) grow around the tree trunks.

The tallest in the emergent layer are exposed to chilling winds and therefore the tree's leaves have adapted to be thin and narrow, in order to not lose water in transpiration.

2) Vegetation adaptation to soil: The type and characteristics of vegetation in the rainforest biome is influenced by the soils which are latosols.

These soils are heavily leached due to the high precipitation levels. Latosols are red/yellow coloured because there is only aluminium and iron compounds left after leaching.

They are the product of a hot wet climate where the process of laterization is dominant. THere are exposed to chemical weathering and high temperatures. They can be 30m deep, and though there are rapid processes of humification soils are often infertile.

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The process of humification and the ongoing nutrient cycle only takes place in the O Horizon on the topsoil (top 20cm). This is where most nutrient are found. Plants have developed shallow roots to reach them. Shallow root networks grow out above the ground level to avoid competition for soil. They form a surface mat that allows them to absorb nutrients faster and more easily.

The tallest emergent layer trees eg Mahogany have developed high and thick supports called buttress roots up to 7m high. They allow trees to maintain their nutrient supply as well as structure support.

Other trees eg palm trees have grown stilt roots which grow down the branches, thus avoiding competition for soil. Trees and plants have also developed roots that absorb nutrients instantly, before heavy rain washes it away.

The seeds of a strangler fig tree are dropped on to another tree. As it grows it sends arid roots down, which as they mature they surround the host tree. The fig's branches grow to the light and strangle the host tree-sucking nutrients from it.

Bromeliads eg the pineapple tree have leaves which overlap at their base to form a vase. This traps nutrients (leaf litter and droppings) thus avoiding competition for soil.

3) Animal adaptations: because of the climate and soils there is an abundance of vegetation. Because of this animals have adapted in camouflage, body structure in order to survive in this biome.

Because there are so many creatures living in the rainforest, there is a great deal of competition for food and space. To avoid overcrowding while feeding, creatures have adapted by foraging for food by night (nocturnal) or only feed during the day. eg flying lemur.

Animals have adapted indirectly to climate and soil by becoming able to live in tall trees which have grown because of soil and climates;

Adapted by camouflage and colour, body structure and animal-plant relationships.

Looking like a dead leaf or twig is one of the most common forms of camouflage, especially in moths and tree frogs. This is to blend in with the dead leaf litter on the forest floor and hide from predators.

Some animals use colours to stand out and warn predators instead of hiding. Because of the wet climate the forest is very green so animals like the poison arrow frog are bright blue and red to stand out.

Sloths are covered with a greenish layer of algae which camouflages their fur in the tree-living environment Because of the ideal climate algae grows great and provides this camouflage.

Because the tropical climate and latosol soil has produced a layered forest of tall trees, many animals must adapt to living in trees. They travel between trees and must be good climbers.

Flying squirrels have evolved flaps of skin between their front and back legs. This allows them glide between trees rather than jump.

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THe climate and soil have allowed trees to grow up to 80m, having a tail that can wrap around a tree branch (a prehensile tail) is a useful adaptations seen in the spider monkey who lives in the canopy layer. This enables it to reach food in compromised areas.

To avoid competition for food in the tropical climate some animals have become very specialised. Because of climate and soil there is an abundance of different types of food. Animals have adapted to eat specific plants that few others eat.

Parrots and toucans eat nuts and have developed big strong beaks to crack open the tough shells of Brazil nuts. This adaptation has insured that they will get food.