Laurea / B.A.
in Global Governance

7. BIOMES

TROPICAL RAIN FOREST

2020/2021

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FORESTS

Forests are one of the most important biomes on earth.
They provide a wide range of “ecosystem services,” from watershed protection and carbon absorption to renewable energy and timber production.
Important reservoirs of plant and animal biodiversity, forests provide key components of the environmental, social and economic well-being of societies around the world.

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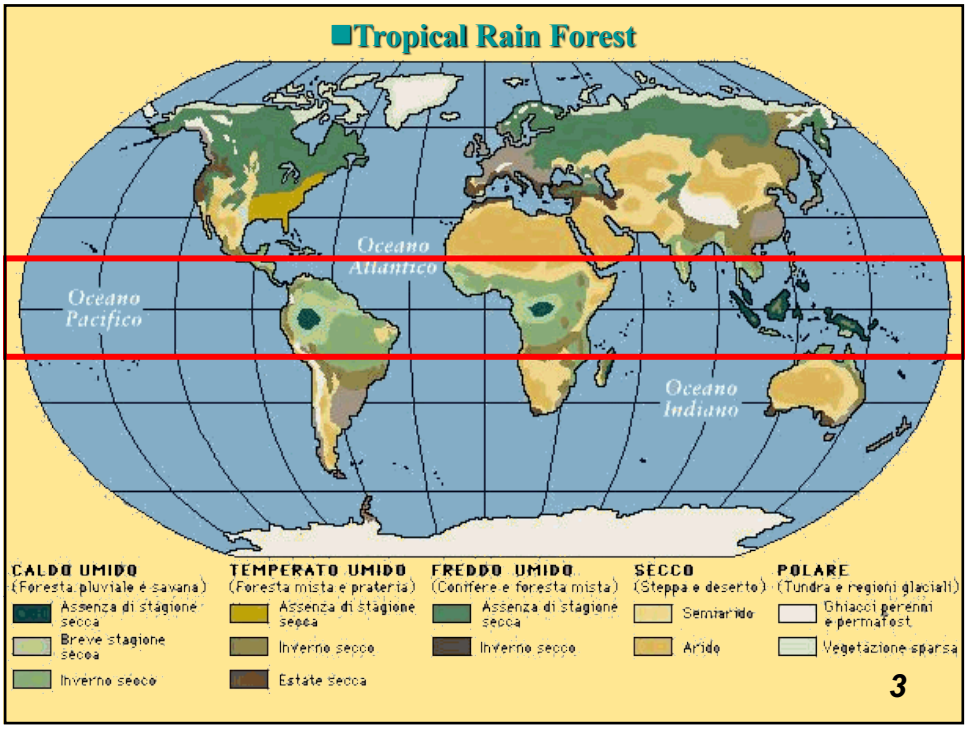

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- **Extension is 6% of the planet's surface**
- **Productivity is 1/3 of total vegetation**
- **It's the oldest biome, all the species appeared during the transition from the upper and the lower Cretaceus: 100 milion years of climate stability which create the extreme complexity and variety of nowdays ecosystems**
- **The species have a restricted areal and long time evolution and stability created the condictions for ADAPTIVE RADIATION, letting plant and animal species occupy all the niches.**

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CLIMATE

Megatermic humid climates of the Intertropical BELT

A class climates are among the humid climates of the intertropical zone (all months with temperatures exceeding + 18 ° C and annual Tm ~ 30 ° C).

Typical intertropical climates

Average minimum temperature never <15 ° C

Annual precipitation of up to 12,000 mm never less than 2,000 mm

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Megatermic humid climate

Equatorial or rain climate

25° < T annual average< 30°

Annual average precipitations>2000 mm

NO dry season

Monotonus climate during the entere year

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Lush vegetation and impenetrable evergreen species

Monsoonal climate AW

T chance by region

Rainfall pattern:

Heavy rainfall (May-October)

Dryness (October-May)

Dry winter season

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Jungle with many deciduos species

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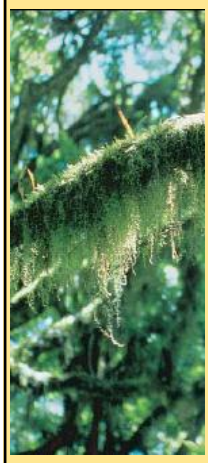
EQUATORIAL OR RAIN CLIMATE AF:



– Equatorial climate occur all year with:

- Monotonous T: annual average
- 25° - 30° C, with fluctuation of max 2° - 3° C
- Low temperature change during daytime

Substantial rainfall annual average 1700-3500 mm even up to 8000 mm, short but daily rainfall and moist close to saturation

- Daylight almost 12 hours
- Monotonous condictions imply:
- NO SEASONING, continue growth vegetation
- NO RAINY SEASON, no flowering period.

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Biome features:

- **Mainly located on plains and hills, max altitude 1200m.**
- **High average T**
- **High rainfall mm**

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- **Climatic conditions fairly constant throughout the year.**
- **Missing seasons.**
- **High biodiversity**

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Soil:

The pedogenesis occurs under the action of very heavy rains and high temperatures throughout the year.

Very deep red "ferralitic" soils with low nutritional value

The action of some groups of decomposers (termites, leaf-cutter ants ..) is therefore essential to maintain soil fertility

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Organic matter decomposed by termites gr/m^2/year

Forest type	Organic matter	% of litter
Sarawak a Dipterocarpaceae	20	2,1
Keranga	35,3	3.4
Malasya	155,4	14,7
Dipterocarpaceae	173,2	16,3
Venezuela	59	5

300-650 tons/ha dry matter
1100-1500 tons/ha per year Sarawak and Brunei

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Biome features:

Red Lateritic soil:

- **Reddish or ocher (oxides of Al or Fe)**
- **Low humus**
- **Maximum 10 m deep**
- **Washout causes acidity and low nutrient content**

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Simple lateritics soils formation:

- **Very deep (up to 10 m), ochre colored**
- **PEDOGENESIS: fast decomposition helped by high temperature and moist, so the A horizon is very thin, altought the presence of lush vegetation, acid mull.**
- **High rainfall and high T rush up fisical- chemical process:**
- **decomposition of organic matter in about 4 weeks**

Mineral fraction is altered by the complete hydrolysis of the silicates with release of silicium (completely removed), Fe hydrate and Al and bases. Fe_2O_3 and Al_2O_3 SiO_2 insoluble accumulate B0 in the horizon in the form of hydroxides

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This kind of soils are called FERRALITICS, with the following horizons:

- A – **thin and acid humus horizon**
- E – **light brown washup horizon**
- B_0 – **horizon rich in Al and Fe**

Ferralitic soils are rich in sesquioxides of Fe Al can induce the formation of shells and lateritic armor, for surfacing B horizon that turns into a layer hard and impenetrable to plant roots

BULDOZER

For this reason, following the cutting of tropical forest will bring to soils rapid degradation of this soils

Intensive and continuos washup is the reason of low nutrient content; fertility is supported by mushrooms and termites.

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Soil

High rainfall and high temperature

Acceleration chemicals and physical processes

Fast degradation of organic matter

Acid soils with low content of nutrients

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FOREST TYPES

DISTRIBUTION CLASSIFICATION:

1 Amazonia: mostly Papilionacee e Cesalpiniacee

2 Malaysia e Indonesia: Dipterocarpacee forest

3 South and Western Africa: mostly Cesalpiniacee

•LATITUDE CLASSIFICATION:

1.Evergreen equatorial forest, among equatorial line

2.Humid forest in Western Africa

•ALTITUDE CLASSIFICATION:

1.The lowland tropical rainforest at altitudes below 1200 meters

2.The tropical rainforest mountain grows in the mountains and above an altitude of 1200 meters

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VEGETATION:

- Thick evergreen forest
- **2,500 tree species (one third of the timber of the planet) and 30 000 of 100 000 species of plants that exist in all of Latin America**
- 40% of the plants are **ENDEMIC** (Ebenaceae, Pindaceae)

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- NO Gymnosperms
- Many species of Angiosperms: *Bignoniaceae, Bromeliaceae, Euphorbiaceae, Mimosaceae, Myrtaceae, Oleaceae, Caesalpiniaceae, Palmae, Orchidaceae, Dipterocarpaceae.*
- **Palm** trees of various type
- Different species of ***Ficus***
- ***Dalbergia nigra*** and ***Dalbergia latifolia*** (rosewood), ***Diospyros ebenum*** **(ebony)**, ***Swietenia*** **(mahogany)**.
  Extrimely required in cabinet.
- The mangroves grows in swampy areas and where the forest is spread along the sea, mangroves have aerial roots that sink in the mud or water.

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- The gross primary productivity (GPP) is total ecosystem photosynthesis and has been found to be approximately
- According to tropical forest types (dry to wet, lowland to montane, nutrient-rich to nutrient-poor soils), the estimates of total NPP range from 3.4 to 34.4 Mg/ha/yr (lower bounds) and from 6.2 to 63.0 Mg/ha/yr (upper bounds).

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Biodiversity and biomass:

Long and constant time for evolution:

⇩

Biodiversity in flora and fauna

⇩

Species with restricted areal

The tropical rainforests are ecosystems in which the phytomass is more elevated, estimated that between 300 and 650 t / ha of dry matter.

⇩

In the forest type keranga to Dipterocarpaceae Sarawak and Brunei are also populations of 1100-1400 t / ha

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reproductive strategy

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peculiar reproductive strategy

The bloom does not happen every year

For some years the seedlings grow in the shade of the forest

The stability of the forest is based on the permanence of the seedlings are ready to move from environment to sciafilous heliophilous

Inversion of the formation mechanism of the canopy

For a type growth monopodial, following a accretion Sympodial

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stratification

Fig. 18.2. *Profilo di una foresta densa tropicale a Dipterocarpacee da Belalong (Brunei). Gli alberi dominanti sono: (D2)* Hopea bracteata*; (D5)* Shorea laevis *e (D6)* S. parvifolia. *Le altre specie (45 in tutto), di cui non si riportano dettagliatamente le denominazioni, costituiscono gli strati arborei inferiori* (modificata da Withmore, 1985).

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stratification

The complexity of the forest is visible in its vertical architecture from the highest layers:

- *TREE LAYER*

- *Lianas*
- *Epiphytes*
- *HERBACEOUS LAYER*
- *MOSSES AND LICHENS*

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Structure of the forest

top tree layer:

- **High 40-50 m trees emerging in discontinuous coverage that germinate and grow in the shade (sciaphylous or heliophylous)**
- **not much humidity and windy conditions**
- **leaves quite small, no drip tips.**

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Structure of the forest

Middle tree layer:

- **full coverage**
- **20-30 meters above the ground**
- **brightness discreet**
- **average humidity and poor presence of wind**
- **oval leaves, with drip-tip**

lower tree layer:

It consists of high plants from 5 to 20 meters that fade in the shrub layer

- **Very dense, intricate shrubs, that includes palm trees and tree ferns.**
- **high humidity no wind**
- **Zoophilous pollination**
- **cauliflory**
- **rays of the sun penetrate barely (about 5%)**

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Erythrina crista-galli,

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Structure of the forest

Herbaceous layer:

- ***low floristic diversity (especially pteridophytes) for the reduction of light intensity that falls to the ground at 0.5-3%. The species can also reach 2 m in height***
- **high humidity**
- **Herbaceous species large vegetative development, giant ferns, carnivorous plants**

Lianes:

- Very abundant
- Even palms BEARING LIANA(*Calamus*)

Epihytes :

- They grow on the tops of the trees
- evergreen,
- rooting grow on tree branches
- are only tropical, include: Bromeliaceae, Orchidaceae, Piperaceae, Rubiaceae, Urticaceae, ferns

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Piperaceae

Peperonia rotundilimba

LIANAS

Woody climbers who use the trunks of trees to climb up to the tree canopies where there is greater availability of light.

Lianas makes up 40% of the tree canopies.

The lianas in some cases can also act as tie rods improving the stability of the trees.

Vitaceae

Berchemia scandens

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Epiphytes

Herbaceous plants and shrubs, COMPLETELY INDEPENDENT, that live in the trees of the tropical forest

↓

Using the tree on which settled only as support while they are totally exposed to the environment air

Epiphytism is a STRATAGEM of undergrowth Layer

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Orchidaceae

Polystachya sp.

Mystacidium capense

Bromeliaceae

Tillandsia sp.

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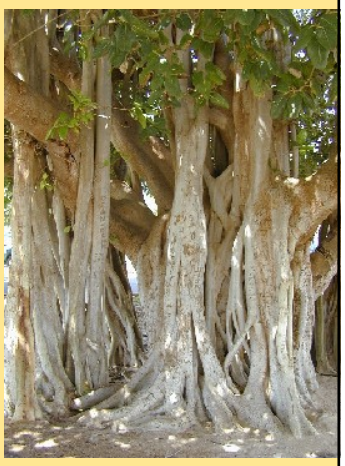
It's difficult to recognize which are the real epiphytes

Moraceae

Ficus aurea

Ficus aurea



Ficus benghalensis

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Polypodiaceae

Morpho-functional organization consists of a dual system of fronds assimilation

Platycerium coronarium

Platycerium bifurcatum

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hemiparassitism:

It is a Parasitic partial that perform photosynthesis but subtract the water and minerals from solutions of the branches of the trees

Lorantaceae

Aethanthus nodosus

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Tropical rain forest in America

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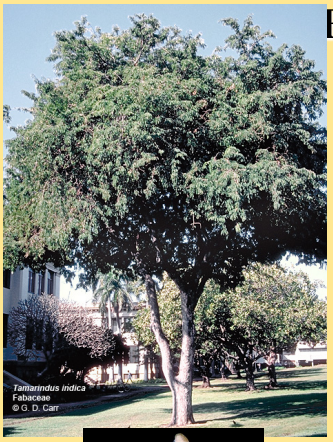
Caesalpiniaceae



Bignioniaceae

Tecoma stans

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CAESALPINIACEAE

- **The family of Caesalpiniaceae, with the family of Mimosaceae and Fabaceae (or Leguminosae) is in the order of Fabales, includes four tribes (Caesalpinieae, Cassieae, Cercideae, Detarieae)**
- **Native to subtropical and tropical regions, are mostly woody species bearing tree and shrub**
- **Used mostly for their medical properties, precious wood and for the extraction of dyes**

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Papilionaceae

Abrus precatorius

Lothus berthelotii

Other important families are: Sapoteceae, Bromeliaceae, Lauraceae and Rosaceae

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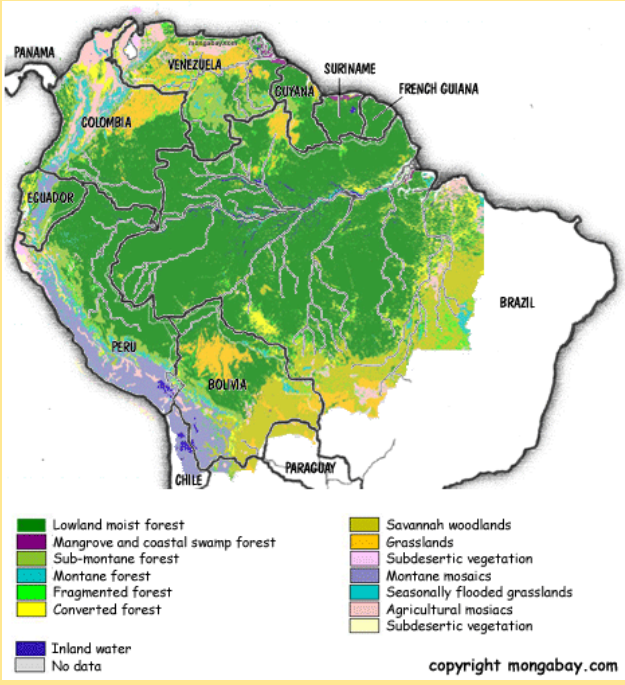

The known area of Amazonia or the Amazon Basin is more than 7 million square kilometers, though the forest itself occupies some 5.5 million. The forest stretches for 60% of the land in Brazil, but also extends to Colombia, Peru, Venezuela, Ecuador, Bolivia, Guyana, Suriname and French Guiana.

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Rubber tree - Hevea brasiliensis

- **The rubber tree is native to the Amazon.**
- **The exploitation of plants, of which the latex is collected by making an incision in the bark, began in the nineteenth century.**

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- **Vulcanization of rubber latex is obtained, or rubber, a milky substance, with waterproofing properties.**
- **In the mid-nineteenth century began attempts to export the plant, but the seeds did not resist travel, rotting in the holds of the ships before you get to your destination.**

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- In 1876 an English managed to collect 70 thousand seeds of rubber trees, to pack them with sawdust in baskets of banana leaves, and ship them to England. The load of seeds arrived intact at Kew Gardens, where germinated in the greenhouse.
- In twelve years in the British colonies of Ceylon, Malaysia and Singapore grew ten million plants.
- Modern industry has greatly developed the use of latex, just think about the production of tires for the automotive and aeronautics.
- Latex is a good import from Brazil and Southeast Asia.
- The plantations of Southeast Asia are still the only existing.

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Mahogany

Dominican Republic

Flag of Belize

Resistant timber,

The tree has a trunk that grows continuously throughout the year

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Theobroma cacao

is an evergreen tree, 5-10 m tall, native to South America.

The cocoa plantation is cultivated between the 20th parallel north and the 20th parallel south, at an altitude lower than the wild species, so as to make harvesting the cocoa easier.

There are three large areas where it is grown in large quantities, in particular:

American Cocoa: grown in Mexico, Brazil, Colombia, Ecuador and Venezuela.

Asian Cocoa from: Indonesia and Sri Lanka.

African Cocoa from Ghana, Cameroon, Nigeria, Ivory Coast and Madagascar.

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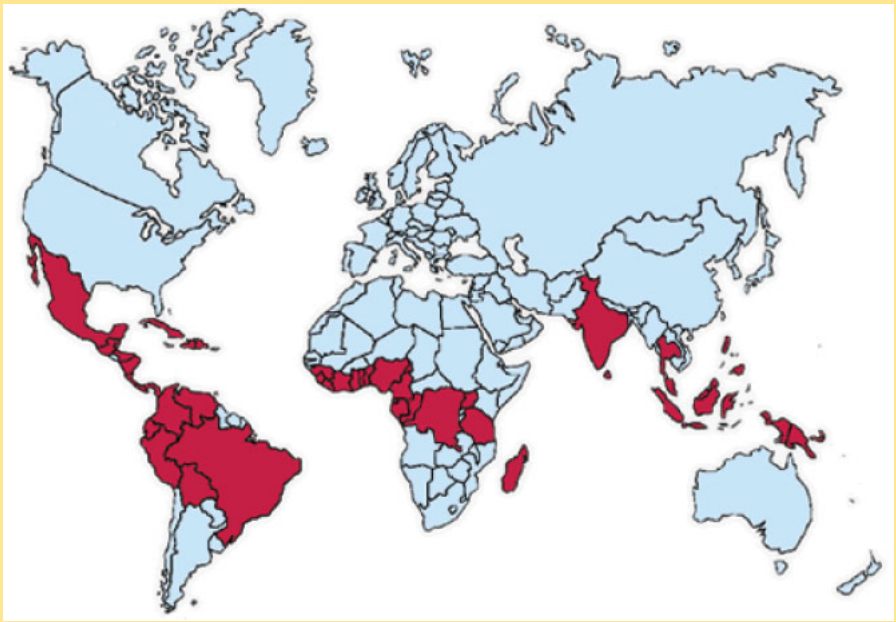

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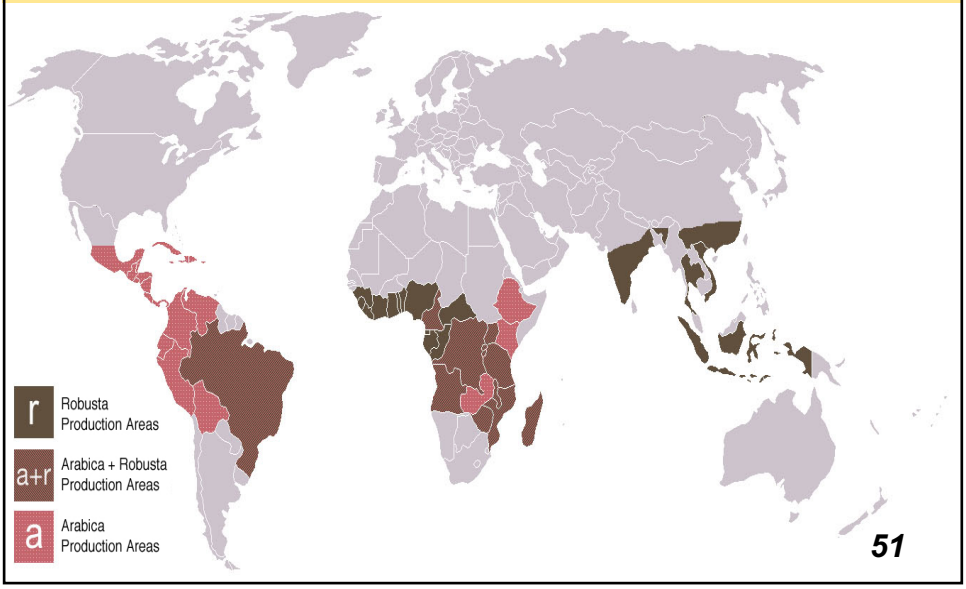
Coffea



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Coffee

Coffea is an evergreen plant, native to Ethiopia but now widespread in all tropical countries, belongs to the family Rubiaceae and is the famous coffee plant.

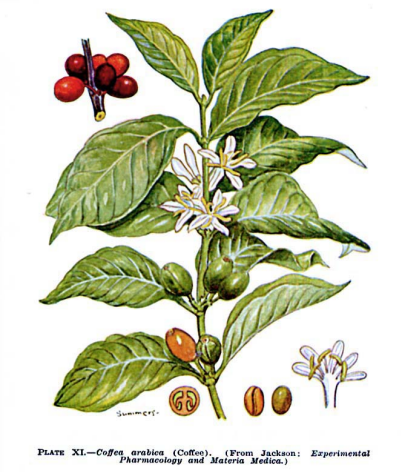

PLATE XI.—*Coffea arabica* (Coffee). (From Jackson: *Experimental Pharmacology and Materia Medica.*)

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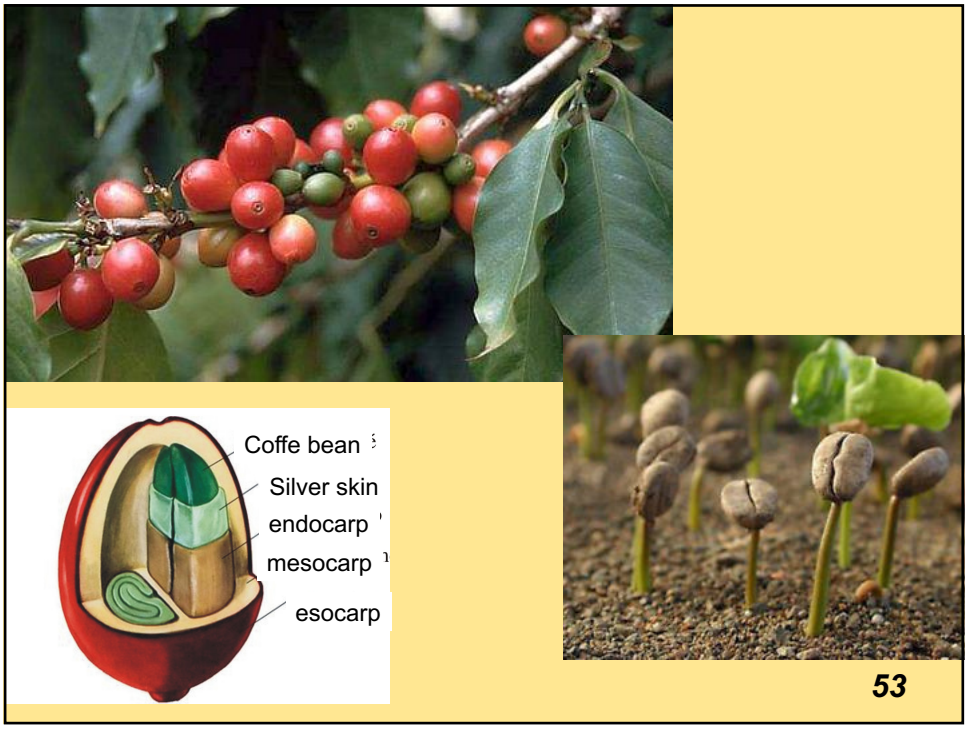
Coffe bean
Silver skin
endocarp
mesocarp
esocarp
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Tropical rain forest in Indo-Malay areas

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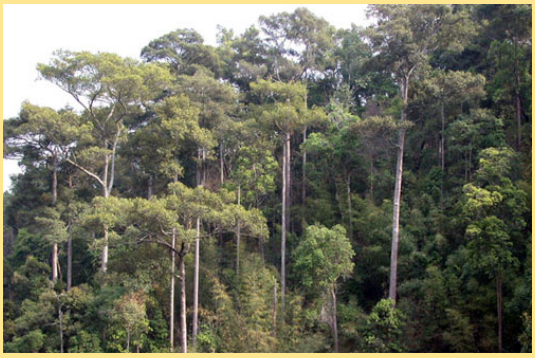
Tropical rain forest in Indo-Malay areas

Dipterocarpaceae



Dipterocarpus costatus

Dipterocarpus alatus

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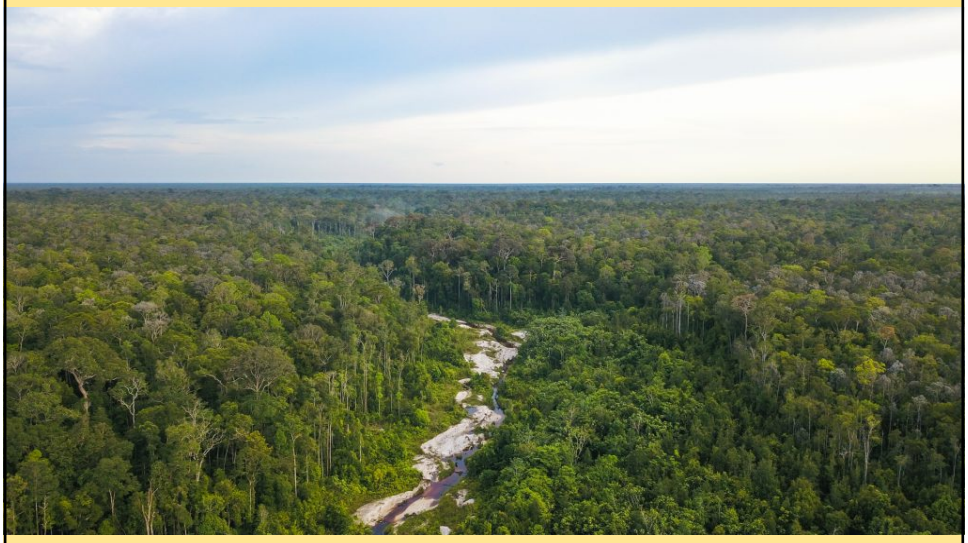

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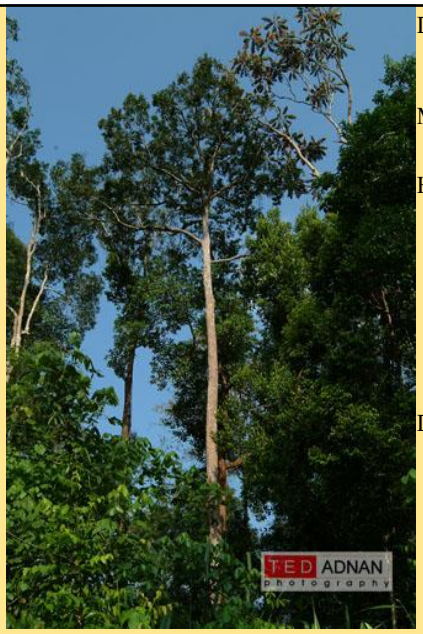
Tectona grandis

Native to the forests of Burma and Thailand, is one of the most valuable tropical timber used for furniture and nautical



Gonystilus bancanus

Dominates the swampy forests of Malaysia and Indonesia.

Heavy solid wood easily workable, used for window frames, do-it-yourself, furniture ..

Despite belonging to the IUCN Red List and is subject to trade restrictions traffic is still active

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Tropical rain forest in Africa:

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Ebenaceae

Diospyros ebenum (Ebony, ornamental species in risk),

Diospyros

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Meliaceae

Ptaeroxylon obliquum

Khaja senegalensis

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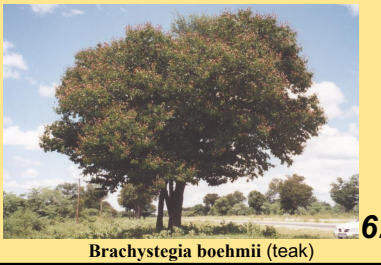
Genus in tropical Africa:

- ***Brachystegia spp***: 30 species in tropica Africa
- ***Dialium spp***: 35 species of tropical Africa and Madagascar

Brachystegia woodland

Dialium laurinum



Brachystegia boehmii (teak)

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