Food & Animal feed

The recommended daily intake of protein depends on body weight: it takes about 0.8 grams of protein for every kilogram you weigh.

The average protein consumption in France is 1.4 g protein/kg body weight/day of which about 65% is of animal origin.

In order to meet the current demand for food (and in consequence animal feed), whether of plant or animal origin, a substantial area of cultivation and paturages is needed.

Forestry

13% of tropical deforestation (680,000 hectares) is driven by expansion of tree plantations into native forests for paper and wood.

Tropical wood is used for commercial purposes (by public or private groups) and for domestic use, or to make firewood, perchis, and coal.

France is the sixth European importer of timber from illegal deforestation.

Pasture

3

A lot of lands are needed in order to raise the animals we feed on, especially beefs.

Thus, 41% of the tropical deforestation, or 2.1 million hectares per year, is driven by pasture expansion for beef.

Cropland

Many human activities requiere resources cultivated on deforested lands.

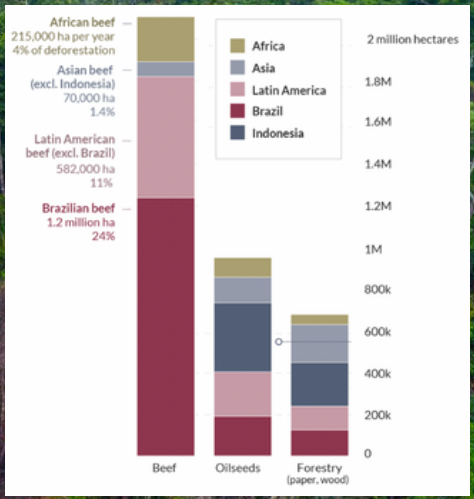
Croplands are therefore divided in different cultures depending on their use, including livestock feed.

However, most of the croplands that drive the deforestation are used for oilseeds production (mainly soybean and palm oil). Oilseeds are responsible for 18.4% of tropical deforestation, even if other crops have non-negligible impact on deforestation.

Tropical deforestation

5

The main drivers

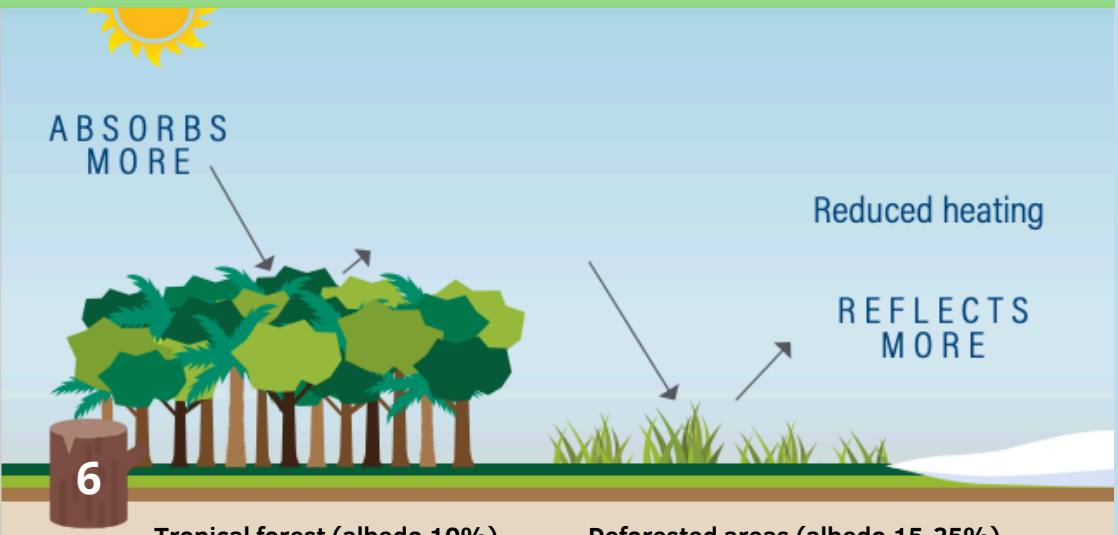


Source : OurWorldInData

Tropical forests register the highest rate of deforestation (89%), with the greatest losses in the tropical rainforests, where 40 percent of the total forest losses occur.
Half of this tropical deforestation takes place in Brazil and Indonesia.

If the rate of deforestation slowly decreases - especially in tropical areas - it is still not enough to compensate for the levels of deforestation we face currently.

Albedo change



Tropical forest (albedo 10%) **Deforested areas (albedo 15-25%)**

Source : Wolosin and Harris 2018

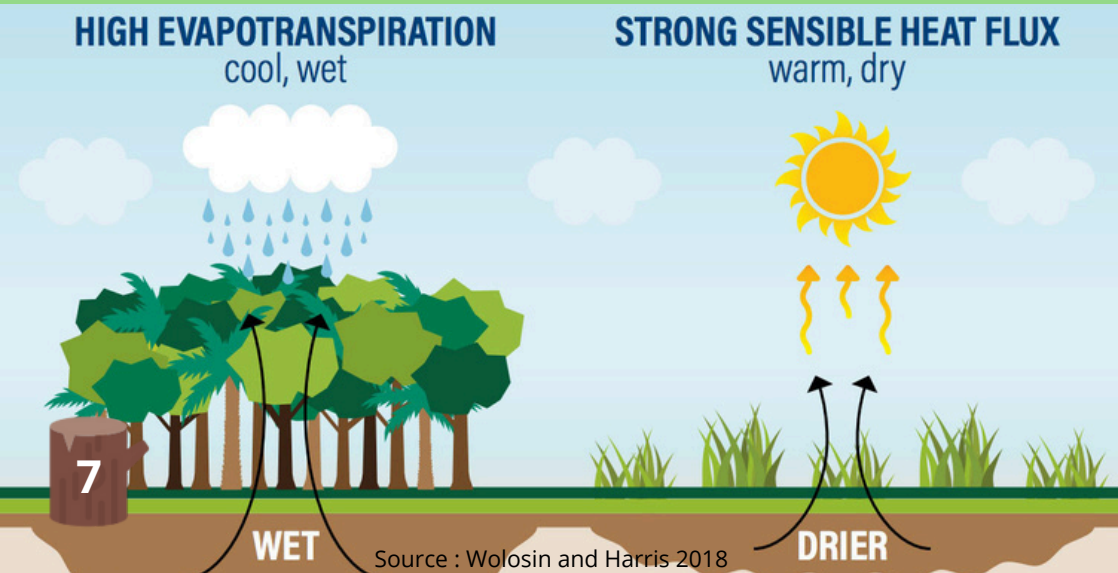
The albedo is the fraction of solar radiation reflected by any surface (in %).

Forested areas have lower albedo values than cropland, and therefore reflect less incoming solar radiation.

Thus, surfaces of forest warm up by absorbing solar radiation.

By only looking at the change of albedo, you could conclude that deforestation will lead to a decrease in temperature...

Evapotranspiration change



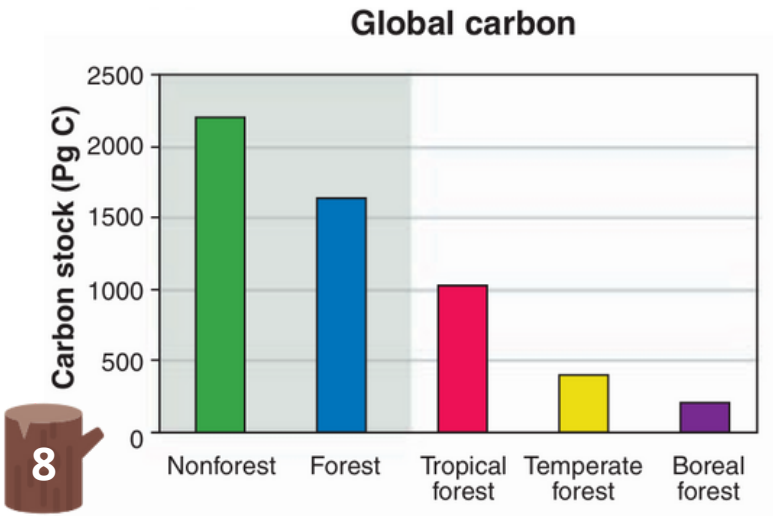
Source : Wolosin and Harris 2018

Energy is dissipated at the surface via latent heat (evapotranspiration) or sensible heat.

Forests release more energy in the form of latent heat than sensible heat, and thus tend to maintain a cooler surface. Therefore, deforestation leads to a decrease in air humidity and thus an increase of local temperature.

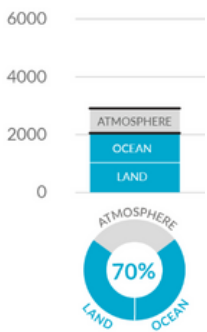
Moreover, a reduced evapotranspiration has an impact on the water cycle and especially leads to a smaller cloud cover.

Land carbon stock



Source : G.B. Bonan 2008, Forest and Climate Change

Cumulative CO2 emissions since 1850 (GtCO2)

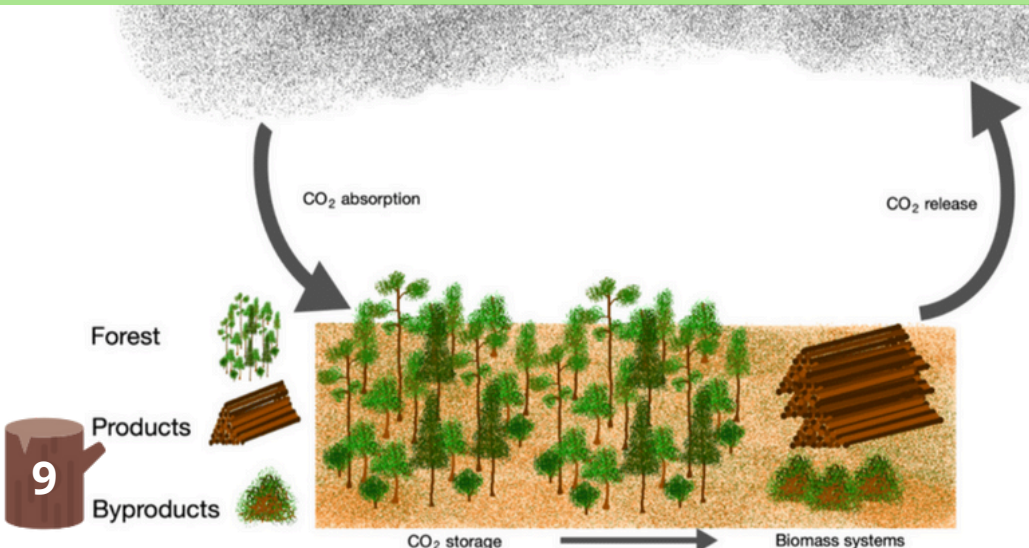


Source : IPCC Report AR6

Worldwide, forests represent about 40% of the land carbon stock, of which tropical forests are the ones containing the most carbon.

Tropical forests are also the ones that capture the most carbon in biomass and soil. CO_2 is absorbed thanks to photosynthesis. A smaller part of this is released through respiration by plants and microbes.

CO2 emissions



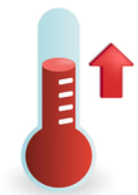
Source : Nunes et al., 2020

Deforestation is the main driver of land-use emissions, remaining high at 6.7 +/- 1.5 $GtCO_2$ per year for 2012-2021.

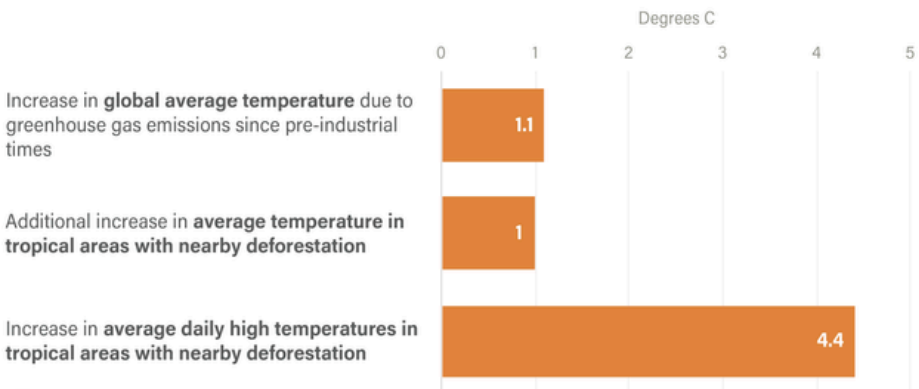
Tropical forests, which store the most carbon, are also those which release the most CO_2 when they are deforested. The trees which allowed the storage of CO_2 are transformed into wooden products, which will ultimately be burned releasing CO_2.

Then, this CO_2 will participate to the additional greenhouse effect leading to an increase in temperature.

Temperature impacts



Heat stress is rising in tropical areas, due to climate change and local deforestation



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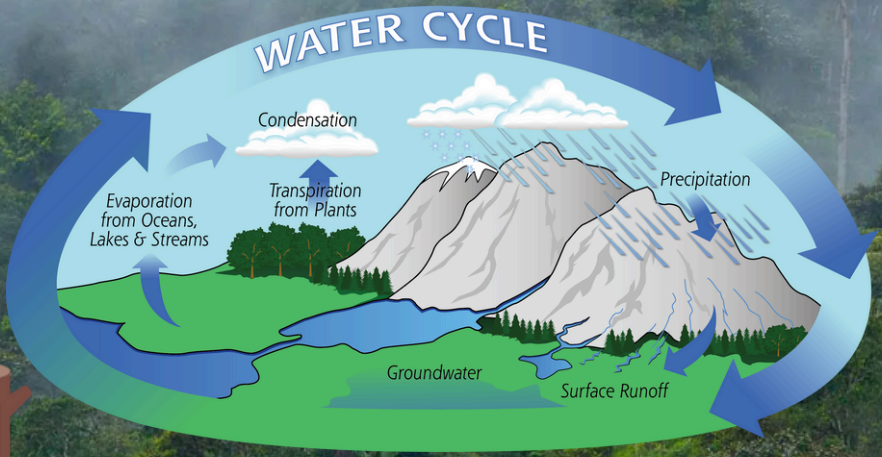
Deforestation has local and global effects on air temperature.

It contributes to global warming since it emits GHGs, but it mainly leads to a high local increase in temperature.

The balance between albedo change, evapotranspiration change and CO_2 emissions can increase by 4.4°C the average daily high temperatures in tropical areas with nearby deforestation.

Disruption of the water cycle



Tropical forests play a vital role in regulating the water cycle through a process called transpiration, where trees release water vapor into the atmosphere.

Deforestation disrupts this process, reducing transpiration rates and altering regional precipitation patterns.

Consequently, areas experiencing deforestation may face decreased rainfall, leading to droughts or increased rainfall intensity, causing floods.

Soil erosion

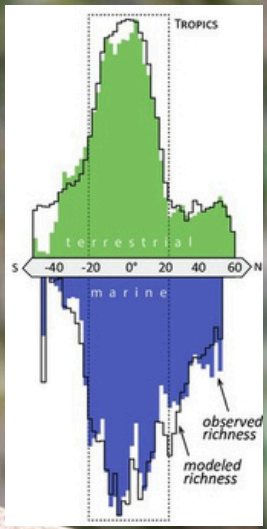
Source : WWF

Throughout the tropics, the erosion is due to the loss of trees, which anchor the soil with their roots. When agricultural plants such as coffee, cotton, palm oil, soybean and wheat remplace trees it actually worsens soil erosion.

Erosion sweeps the land into rivers.

Costa Rica loses about 860 million tons of valuable topsoil every year. Meanwhile the Great Red Island, Madagascar, loses so much soil to erosion (400 tons/ha) that its rivers run blood-red, staining the surrounding Indian Ocean.

Biodiversity



Source : Gagné et al., 2020

Tropical forests, which cover only about 7% of Earth's land surface, are home to over half of the world's plant and animal species.

It is estimated that deforestation contributes to the extinction of approximately 27,000 species every year, according to the World Wildlife Fund (WWF).

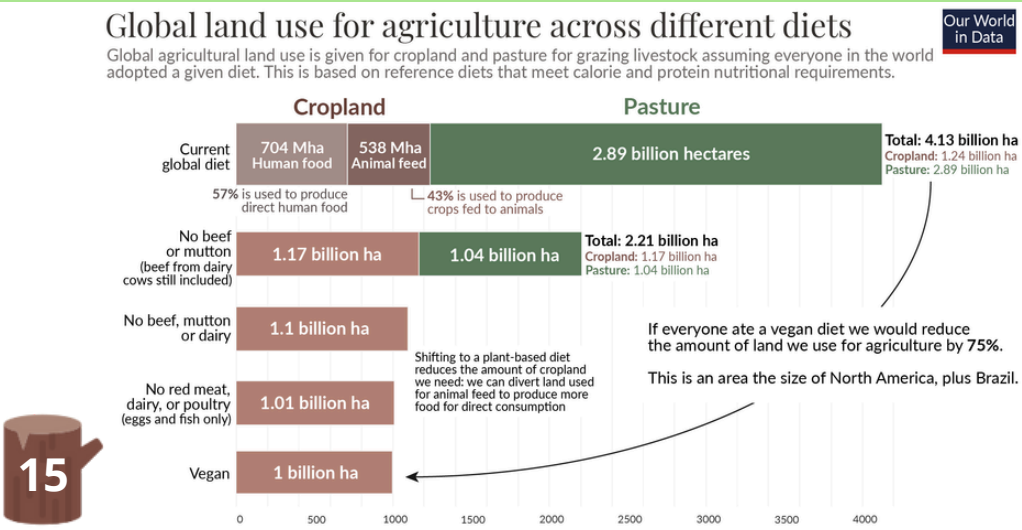
This loss of habitat not only affects iconic species like orangutans and jaguars but also disrupts intricate ecological networks, impacting everything from pollination to nutrient cycling.

Indigenous population

Tropical forests are the home of several indigenous civilizations. They represent 5% of the global population and more than 200 million live in tropical areas.

These communities, which have profound cultural and historical linkages to their ecosystems of forests, encounter a range of devastating repercussions due to the rampant destruction of their ancestral territory. These impacts include loss of traditional land, health impacts due to water contamination and air pollution, threats to cultural identity, and the loss of subsistence and livelihoods.

Dietary changes



In order to reduce the tropical deforestation, dietary changes are necessary.

Indeed, 4.13 billion ha of lands are currently used for agriculture, of which more than half is devoted to paturages. To drastically reduce our consumption of beef would save almost 2 billion ha of lands.

Transitioning towards plant-based diets can lower the need for large-scale agriculture, and thus reducing pressure on tropical forests.