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Poor Farmers Could Destroy Half of Remaining Tropical Forest

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Nearly half of Earth's remaining 5 billion acres (2 billion hectares) of tropical forests could be lost to agriculture, mostly to poor farmers, says a new report by the Consultative Group on International Agricultural Research (CGIAR).

Much of the remaining 2.5 billion acres -- an area larger than all of Canada -- of tropical forest, on land generally not suitable to agriculture, are endangered by potentially harmful logging, warns CGIAR.

The annual rate of tropical forest loss is not diminishing, despite rising global awareness, sharply increased aid for tropical forestry, and a decade of international efforts to shape coherent global strategies for saving humanity's tropical forest patrimony, says CGIAR. **Some 72 acres (29 hectares, or ha) of tropical forest are lost every minute,** or 38.1 million acres (15.4 million ha) per year.

"There is no magic bullet to saving the world's tropical forests," says Ismail Serageldin, chairman of CGIAR and World Bank Vice President for Environmentally Sustainable Development. "What is needed is a comprehensive effort on a solid scientific basis to attack the root causes of deforestation -- poverty, rising population, bad natural resource management and distorted forest policies."

CGIAR says that deforestation is a complex problem that requires many simultaneous and complementary initiatives, such as assisting farmers in raising their output on their present land, developing new tropical tree types that are more productive, and developing environmentally sustainable logging practices.

The report demonstrates that the main threat to tropical forests comes from poor farmers who have no other option to feeding their families other than slashing and burning a patch of forest and growing food crops until the soil is exhausted after a few harvests, which then forces them to move on to a new patch of forest land. Slash-and-burn agriculture results in the loss or degradation of some 25 million acres of land per year (10 million hectares).

"Some 350 million people in tropical countries are forest dwellers who derive half or more of their income from the forest. Forests provide directly 10 percent of the employment in developing countries," says Jeffrey Sayer, Director General of the Center for International Forestry Research (CIFOR), based in Bogor, Indonesia, which researches better ways to manage and preserve existing forests. CIFOR is one of two CGIAR research institutes that specialize in tropical forestry.

"We will not be able to protect every acre of existing tropical forest," says Mr. Serageldin. "The needs of a growing population will force the conversion of some forest land to agriculture and settlements. But policies

must be in place that ensure that only the forest land best suited for agriculture is converted, and only where it is vitally needed, and that the most valuable forests, the richest biodiversity habitats, are adequately protected."

CGIAR also says that logging can be done in a careful environmentally sustainable manner that will not damage the forest. There are a few good examples of that. There, the income from sustainable logging can cover the cost of maintaining the forest and raise its value. "What must be ended is the wanton destruction brought about by shortsighted greed and the destitution of the poorest," says Mr. Serageldin.

The other tropical forestry institute is the International Center for Research in Agroforestry (ICRAF), based in Nairobi, Kenya. ICRAF seeks to develop sustainable farming practices for marginal areas that can reduce or even eliminate the need to clear forest for farmland, and help reclaim vast tracts of degraded land using trees to restore fertility to exhausted soils.

Agroforestry

ICRAF researches the integration of trees into farming --- agroforestry -- in order to reduce the pressure on forests by providing farmers with a nearby, convenient source of food, fuelwood and timber for construction and fences.

ICRAF is seeking to improve products from the vast and largely untapped genetic wealth of trees found in tropical forests and woodlands. Tropical tree products include fruits, nuts, oils, resins, medicines, cosmetics, fibers, fodder and dyes -- as well as timber and fuelwood -- all of which contribute to the earnings of rural households, improve food security and reduce the risk of crop failure among subsistence farmers.

Agroforestry is well suited to the forest margins of Latin America, Southeast Asia and Africa, where slash-and-burn agriculture is widespread.

A World Bank study shows that intensification of agriculture induces farmers to plant more trees because of increased need for timber, fuelwood, and the agricultural and environmental benefits of trees. Consequently, rural population growth and intensified farming can be expected to boost agroforestry. Small farmers plant more trees per area than large farmers, says the World Bank study.

"Agroforestry is becoming popular to the point where farmers in some fertile and densely populated developing country regions have planted so many trees -- fruit trees among them -- that the farmland could actually satisfy the official criteria for being considered a forest," says Pedro Sanchez, Director General of ICRAF.

One superb example of sustainable land use comes from the Indonesian island of Sumatra, where agroforestry researchers are working with villagers and policy makers to understand and to protect one of the most intricate agrofarming systems in the world, developed over the past century by farmers who have literally learned how to garden with forest trees over a large area.

After clearing small pieces of land, usually by slashing and burning, the farmers plant rainfed rice for a year, after which they plant coffee and pepper and up to 39 species of indigenous trees, including *Shorea javanica*, which produces valuable damar resin, and jungle rubber, which accounts for 70 percent of the rubber produced in Indonesia.

Once the trees mature, the farmers can harvest --- for two or three generations -- the resin, fruits and other products. These 'forest gardens' preserve biodiversity and safeguard the environment while being economically productive. Entire regions in Sumatra where these forest gardens are found are experiencing an economic boom, while preserving about 70 percent of the plant and bird biodiversity of the original forest in these human-made complex agroforests.

Tree Improvement - Cinderella Trees

For more than a century, scientific research has yielded major advances in food crops such as wheat, rice and corn (maize), by multiplying their productivity and strengthening their resistance against diseases and

pests. CGIAR forestry and agroforestry scientists are now bringing similar improvement to trees.

ICRAF is focusing on 'Cinderella trees', so called because they have been overlooked by researchers and international markets despite their great potential. By using simple, low-tech horticultural techniques to select for traits that farmers and markets find desirable -- larger fruits, lower crowns, better quality nuts or oils -- ICRAF researchers are encouraging farmers to grow trees on their farms.

Tropical trees and crops with the most potential include:

Bush Mango (*Irvingia gabonensis*) -- Farmers in the humid lowlands of West Africa have identified the bush mango for ICRAF tree-improvement work. People eat the fruit and make a thickening agent for stews from the kernels, and it is a major item of trade in regional markets. Researchers have collected seed and established live genebanks, and are now starting to improve the tree according to farmers' preferences. This means developing a tree that is shorter to facilitate fruit harvesting and also one that produces more and bigger fruit, over a longer period of the year.

Peach Palm (*Bactris gasipaes*) -- Peach palm is indigenous to the Upper Amazon, where it has been domesticated over several centuries. It produces food and animal feed from its fruits, medicines from its roots and wood for parquet floors. It also produces the delicacy heart of palm, or "palmito," worth about \$50 million a year on the international market.

Masuku (*Uapaca kirkiana*) -- This is one of 50 valuable species of fruit trees found throughout the indigenous African woodlands, known as miombo, that stretches from Tanzania south to Malawi. It is an undomesticated tree, valued for its juicy and tasty fruit, wood and medicinal products. At the moment, it is found only in the woodlands or on farms, where farmers deliberately leave it standing when land is cleared for cropping. Researchers are now looking at ways to domesticate this tree for more intensive use on farms. Besides its use for juices, squashes, porridge, jams and cakes, it is also used to make the popular wines called "mulunguzi" and "masuku."

African plum (*Dacryodes edulis*) -- The African plum, a tree indigenous in the humid lowlands of West Africa, produces a popular fruit that is cooked before it is eaten. It is probably the most widely planted indigenous species in the region, but its domestication would ease propagation for use on farms, and also help develop higher-value fruit with more pulp that could fetch more in local and regional markets. An ICRAF farmer survey identified the African plum as one of the top five priority species in the region.

Pygeum (*Prunus africana*) -- The pygeum bark is the industrial source of a drug used to treat benign hyperplasia (abnormal increase in tissue growth) and prostate gland hypertrophy, ailments suffered by 60 percent of older men. The current trade in this bark is estimated at \$150 million per year. Its overexploitation in its natural African ecosystem is causing concern for wildlife in the zone where it grows. Its domestication could bring economic, social and environmental benefits in the tropics. At present, the drug is not synthesized industrially.

Meru oak (*Vitex keniensis*) -- Meru oak, like many other quality timbers such as mahogany, does not grow well on plantations. Farmers in Kenya and Cameroon are now starting to grow a few trees on their farms, which may become important for the future of the timber industry, and for small-scale farmers.

Conserving and Managing Forests

One of CIFOR's priorities is to find ways to increase the benefits to local people from conserving and managing the forests -- such as finding new markets for underutilized forest products. Another method is through developing management structures that better involve local communities in making decisions about how forests are used.

"Wood and wood products make up only 50 percent of total forest product value; the non-wood products constitute the other half," says Mr. Sayer. "Research conducted by CIFOR on the use and commercialization of these products effectively raises the income of the poor and makes their existence sustainable without a single acre of forest being felled. Those living by gathering and using these forest products -- mostly women -- are among the world's poorest. Their indigenous knowledge about non-wood products needs to be matched with modern science, and further erosion of this precious knowledge must be prevented."

CIFOR is also studying how tropical forests respond to different kinds of land management through landscape studies in different parts of the world. These studies provide the scientific basis for finding new techniques for harvesting forests in ecologically sustainable ways. This "reduced impact logging" has already demonstrated great potential to minimize soil erosion, retain biodiversity and reduce by over 40 percent the carbon released when loggers fell trees.

"When people's continuing livelihoods depend on a healthy forest, they can and do protect and manage that forest," says Mr. Serageldin. "Another way of increasing the value of forest land, as well as discouraging non-sustainable logging practices, is by raising the value of timber from sustainable production. Current efforts to introduce eco-labeling for environmentally sustainable production are expected to help labeled wood products fetch higher market prices."

Alternatives to Slash-and-Burn Agriculture

Many slash-and-burn farmers moved only recently into the forest areas and many never have farmed before, causing unnecessary destruction to the land. Often, they occupy forest land left behind by logging companies, or follow roads built by loggers into the forest.

ICRAF, CIFOR, national and international institutes, non-governmental organizations (NGOs) and universities have joined forces in a global effort to combat unsustainable slash-and-burn agriculture, a CGIAR system wide program known as the **Alternatives to Slash-and-Burn**, or ASB. In the long run, ASB will help reduce global warming, conserve forest biodiversity, alleviate poverty and increase food security by developing sustainable alternatives to slash-and-burn agriculture. ASB has research projects in tropical forest margins of Indonesia, Thailand, Cameroon, Brazil, Peru and Mexico.

With many workable technological alternatives to slash-and-burn already in hand, researchers are turning their attention to the all-important arena of policy. In much of the tropics, government policies actually encourage migrants to head into forest regions to clear new farms.

ASB researchers are looking carefully at policies on land and tree tenure, because people who have secure ownership of land and trees are more likely to look to the long term and stay put by planting trees and making their land sustainably productive. Policies can make credit available to farmers practicing sustainable farming, encourage community or on-farm tree nurseries, improve farmers' access to markets, strengthen infrastructure and remove bureaucratic obstacles that hinder small-scale farmers.

Adjusted policies are also needed to prevent increased deforestation when the adoption of more profitable farming technology induces farmers to clear more land. Once the options of this policy are institutionalized by governments, there is reason for hope that the benefits of agroforestry and forestry research will be felt in the forest margins throughout the tropics.

In settled areas outside the forest margins, intensification in small farms has actually increased the number of trees. This is evident in the Embu district around Mount Kenya, where smallholder corn (maize) and dairy farmers have planted large numbers of trees along their field boundaries for fodder and fuelwood.

"Such success stories -- small though they may appear now -- can have enormous positive impact when applied over large areas," says Mr. Sanchez. "This can be a win-win situation, where poverty alleviation and increased food security for the millions of people in the tropics also result in preserving the environment. Tree cover is protected or increased, critical watersheds needed to assure a safe water supply to urban settlements are protected, the world's richest source of animal and plant biodiversity is preserved, and carbon is retained in plants and soils, thus minimizing global warming. To paraphrase an old African proverb, it is little people doing little things in a lot of little places that will change the face of the earth."

CGIAR is the world's largest international consortium for agricultural research and is jointly sponsored by the World Bank, the United Nations Development Programme, the Food and Agriculture Organization, and the United Nations Environment Programme. Currently, CGIAR spends about \$300 million per year, about 4 percent of total agricultural research expenditure in and for developing countries. In 1996, the CGIAR is investing \$24 million in forestry and agroforestry research.



Rainforest

From Wikipedia, the free encyclopedia

This article is about the rainforest in general. For more specific information, see Temperate rain forest or Tropical Rainforests.

Rainforests are forests characterized by high rainfall, with definitions setting minimum normal annual rainfall between 1750 mm and 2000 mm.

The largest tropical rainforests exist in the Amazon Basin (the Amazon Rainforest), in Nicaragua (Los Guatuzos, Bosawás and Indio-Maiz), the southern Yucatán Peninsula-El Peten-Belize contiguous area of Central America (including the Calakmul Biosphere Reserve), in much of equatorial Africa from Cameroon to the Democratic Republic of Congo, in much of southeastern Asia from Myanmar to Indonesia and Papua New Guinea, eastern Queensland, Australia and in some parts of the United States. Outside of the tropics, temperate rainforests can be found in British Columbia, southeastern Alaska, western Oregon and Washington, the northern coast of California, Scotland and Norway, the western Caucasus (Ajaria region of Georgia), parts of the western Balkans, Japan, southern Chile, New Zealand, Tasmania, and parts of eastern Australia.



The Daintree Rainforest in Queensland, Australia.

Rainforests are home to two-thirds of all the living animal and plant species on the planet. It has been estimated that many hundreds of millions of new species of plants, insects and microorganisms are still undiscovered. Tropical rain forests are called the "jewels of the earth", and the "world's largest pharmacy" because of the large amount of natural medicines discovered there.

Despite the growth of vegetation in a rainforest, the actual quality of the soil is often quite poor. Rapid bacterial decay prevents the accumulation of humus. The concentration of iron and aluminium oxides by the laterization process gives the oxisols a bright red color and sometimes produces minable deposits (e.g. bauxite). On younger substrates, especially of volcanic origin, tropical soils may be quite fertile.

The undergrowth in a rainforest is restricted in many areas by the lack of sunlight at ground level. This makes it possible for people and other animals to walk through the forest. If the leaf canopy is destroyed or thinned for any reason, the ground beneath is soon colonised by a dense tangled growth of vines, shrubs and small trees called jungle.

In contradiction to popular belief rainforests are not major consumers of carbon dioxide and like all mature forests are approximately carbon neutral ^[1] ^[2]. Recent evidence suggests that the majority of rainforests are in fact net carbon emitters. However rainforests do play a major role in the global carbon cycle as stable carbon pools and clearance of rainforest leads to increased levels of atmospheric carbon dioxide. Rainforests may also play a role in cooling air that passes through them. As such rainforests are of vital importance within the global climate system.

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Trees

There are several common characteristics of rainforest trees. Rainforest species frequently possess one or more of the following attributes not commonly seen in trees of drier climates.

Many species have broad, woody flanges (buttresses) at the base of the trunk. Originally believed to help support the tree, now it is believed that the buttresses channel stem flow and its dissolved nutrients to the roots. Large leaves are common among trees and shrubs of the understory and forest floor layers. Young individuals of trees destined for the canopy and emergent layers may also have large leaves. When they reach the canopy new leaves will be smaller. The large leaf surface helps intercept light in the sun-dappled lower strata of the forest and are made possible because the lower layers are largely protected from winds which damage large leaves in the canopy. Canopy leaves are usually smaller than found in understory plants or are divided to reduce wind damage. The leaves of rainforest understory trees also often have drip tips which facilitate drainage of precipitation off the leaf to promote transpiration and inhibit the growth of microbes and bryophytes which would damage or smother the leaf.



Rainforest on Fatu-Hiva,
Marquesas Islands

Trees are often well connected in the canopy layer especially by the growth of woody climbers known as lianas, or by plants with epiphytic adaptations allowing them to grow on top of existing trees in the competition for sunlight.

Other characteristics that are more frequent in rainforest tree species than in drier forests include:

- Exceptionally thin bark, often only 1-2 mm thick. It is usually very smooth, although sometimes covered with spines or thorns.
- Cauliflory, the development of flowers (and hence fruits) directly from the trunk, rather than at the

tips of branches.

- Large fleshy fruits attract birds, mammals, and even fish as dispersal agents.

Mining of Resources

Graphite is the main element that is mined in most rainforests. 13.2% of all of the graphite that is in pencils comes from a rainforest.

Rainforest layers

The rainforest is divided into five different parts, each with different plants and animals, adapted for life in that particular area.

Emergent layer

This layer contains a small number of very large trees which grow above the general canopy, reaching heights of 45-55 m, although on occasion a few species will grow to 60 m or 70 m tall. They need to be able to withstand the hot temperatures and dry winds. Eagles, butterflies, bats and certain monkeys inhabit this layer.

Canopy layer

The canopy layer contains the majority of the largest trees, typically 30-45 m tall. The densest areas of biodiversity are found in the forest canopy, a more or less continuous cover of foliage formed by adjacent treetops.

The canopy, by some estimates, is home to 40% of all plant species, suggesting that perhaps half of all life on Earth could be found there. The fauna is similar to that found in the emergent layer, but more diverse. A quarter of all insect species are believed to exist in the rainforest canopy.

Scientists have long suspected the richness of the canopy as a habitat, but have only recently developed practical methods of exploring it. As long ago as 1917, U.S. naturalist William Beebe declared that "another continent of life remains to be discovered, not upon the Earth, but one to two hundred feet above it, extending over thousands of square miles".

True exploration of this habitat only began in the 1980s, when scientists developed methods to reach the canopy, such as firing ropes into the trees using crossbows. Exploration of the canopy is still in its infancy, but other methods include the use of balloons and airships to float above the highest branches and the building of cranes and walkways planted on the forest floor. The science of accessing tropical forest canopy is called dendronautics: see Dendronautics.

Understory layer

There is a space between the canopy and the forest floor, which is known as the understory (or understorey). This is home to a number of birds, snakes, and lizards, as well as predators such as jaguars, boa constrictors, ocelots, and leopards. Armadillos also live here. The leaves are much larger at this level. Insect life is also abundant. Many seedlings that will grow to the canopy level are present in the

understory. Only about 5% of the sunlight shining on the rainforest reaches the understory. This layer can also be called a shrub layer.

Shrub Layer

The layer just above the floor, consists of mainly large-leaved plants and small trees able to survive on the meager amount of light let through by the canopy.

Forest floor

This region receives only 2% of the rainforest's sunlight. Thus, only specially adapted plants can grow in this region. Away from river banks, swamps and clearings where dense undergrowth is found, the forest floor is relatively clear of vegetation, as little sunlight penetrates to ground level. It also contains decaying plant and animal matter, which disappears quickly due to the warm, humid conditions promoting rapid decay. Many forms of fungi grow here which help decay the animal and plant waste.

Fauna

Rainforests support a very broad array of fauna including mammals, reptiles, birds and invertebrates. Mammals may include primates, felids and other families. Reptiles include snakes, turtles, chameleons and other families. Birds include such families as vangidae and Cuculidae. Dozens of families of invertebrates are found in rainforests. More than half of the world's species of plants and animals are found in the rainforest. This amounts to over 5 million species of plants and animals.

Human uses

Many foods originally came from tropical forests, and are still mostly grown on plantations in regions that were formerly primary forest ^[3]. Tropical rain forests are also the source of many medicinal drugs, with over half the medications originating from the rainforest. Tropical rainforests also provide timber as well as animal products such as meat and hides. Rainforests also have value as tourism destinations and for the ecosystem services provided.

Deforestation

Tropical and temperate rain forests have been subjected to heavy logging and agricultural clearance throughout the 20th century, and the area covered by rainforests around the world is rapidly shrinking. It is estimated that the rainforest was reduced by about 58,000 km² annually in the 1990s. Rainforests used to cover 14% of the Earth's surface. This percentage is now down to 6% and it is estimated by some environmental groups that the remaining natural rainforests could disappear within 40 years (mid-21st century). Biologists have estimated that large numbers of species are being driven to extinction, possibly more than 50,000 a year), due to the removal of habitat with destruction of the rainforests [1]. Protection and regeneration of the rainforests is a key goal of many environmental charities and organizations. Every minute about 40 hectares (100 acres) of the world's tropical rainforest is destroyed. At this rate, it is possible that all the rainforests in the world will have been destroyed by the year 2025. (It is doubtful that this rate will be sustained as the relative cost of logging rises with dwindling resources.) About half the world's species of animals and plants depend upon these forests for their survival.

Another factor causing the loss of rainforest is expanding urban areas. Littoral Rainforest growing along coastal areas of eastern Australia is now rare due to ribbon development to accommodate the demand for seachange lifestyles.

See also

- Cloud forest
- Deforestation
- Illegal logging
- Jungle
- Tropical and subtropical moist broadleaf forests
- rubber tapping

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External links

- Dendronautics An organization involved with tropical rain forest canopy exploration.
- United Nations Forum on Forests
- The Coalition for Rainforest Nationsyugcfskgiuaodgiuoirowomrt89vmotyyour gay

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