

My window frame is made of wood. My desk is made of wood. Every day I have enough food rich in all the nutrition I need. And every day, I have enough clean water to drink and use. Where does this all come from? I watched all last summer as the workers dug up the vegetation in my backyard, which currently is a mini barren wasteland. The small situation in my backyard very well can be applied to the large-scale deforestation in the world. With what seems the blink of an eye, people can destroy the Earth for their own benefit. Forests, especially tropical rainforests, are being cleared at an alarming rate for human and their basic needs. People are destroying the very rainforests that also provide a substantial amount of the water that they also require. In revenge, if the Earth were to stop the ecosystem service of water, humankind would cease. At this point in scientific research, people are fully aware of deforestation and its consequences. Yet, there seems not much that can be done. People do need water. But people still need timber. They still need farmland.

Deforestation is a major ecological problem that occurs all over the world, and more significantly in the rainforests due to the multitude of resources available. For example the Amazon Rainforest in South America, though less than 10% of the Earth's land, contains 26.5% of the world's moist forests. Due to its large size and its high evapotranspiration rate, it is hugely important to the world's climate and hydrological cycle¹. Trees absorb water then release it back into the atmosphere, contributing to the humidity. Deforestation would lead to more space for run-off rainwater and thus a decrease in transpiration, eventually decreasing the overall amount of moisture in the atmosphere. In worst cases, once forested lands can even change into deserts. Like so, deforestation is indirectly responsible for the basis for adequate rainfall and the water cycle, one of the most basic, but also one of the most important ecosystem services to humankind. Because rainforests produce so much freshwater that humans depend on, so much freshwater would also be lost with continuous deforestation. In areas with arid climates where rainfall is already not so abundant, disruption of the usable water provided by ecosystem services would be an even bigger problem.

The causes of deforestation vary throughout parts of the world. A common cause is a natural result of climate change and its consequences such as catastrophes. Increased populations also increase demands for land and wood, which can exceed the carrying capacity of forests. Agriculture is another major cause, especially in Southeast Asia where the agricultural expansion has taken a toll on Indonesia and Malaysia, two countries that once had a significant portion of the world's rainforests². Even cattle ranching in Brazil has taken large areas of the Amazon³. Logging and timber harvesting for construction of roads is significant everywhere; roads can provide a path to search for new lands to deforest, indirectly affecting the situation. In some African countries, timber is used as up to 95% of fuel⁴.

One major, specific cause of deforestation, specifically in the Amazon, was the building of the Belem-Brasilia Highway in 1958⁵. It merely began the whole new road-building plan in order to integrate the Brazilian population to occupy the vast country (see Appendix A). According to statistics, two million people took over the land in twenty years, even increasing cattle population to five million. The spread of population and land speculation had led to the

¹ Moran, 2.

² Moran, 3.

³ Allen, Barnes, 173.

⁴ Allen, Barnes, 174.

⁵ Moran, 3.

belief that clearing forests was improving forests. Other than new roads and relocating people, more recently the Amazon has had to put up with Brazil's mining and timber industries. In 1984, the rainforest itself was 43.6% of the nation's production, as compared to 14% only ten years prior. Some studies even show that these activities lead to 40% of forest mortality⁶.

Studies were done to explore the links between deforestation and its possible causes. One particular study had a detailed analysis of twenty-eight developing countries. It represented developing countries with per capita gross national product less than \$3000 but with forest area greater than 5% of the Earth's total land⁷. The data showed that deforestation rates are determined by function of wood use, socioeconomic development, and land use variables (see Appendix B). Statistics from this study confirmed that deforestation was related to the hypothesized causes based on data from countries in Africa, Asia, and Latin America⁸. Countries that are especially high in population, agriculture expansion, and wood production had the highest rates of deforestation.

But not even studies can completely measure accurately how much forest is being lost. Even the usage of aerial photography is not completely reliable as interpretation is too time-consuming and cloud cover, especially in tropics where the dry and wet seasons result in bad weather, is an additional handicap⁹. Improved technology in the 1970s has continuously monitored the forests of the tropics and produced an estimate of 935 million hectares of forest area. Since then, several other surveys were done to estimate the deforestation rates from thirteen countries taking up 16% of all tropical forests (see Appendix C). Because of logging in these areas, some rates in the 1980s were even twice the rates in the 1970s¹⁰.

If the estimated deforestation from these studies were to continue, the ecosystem service that precious rainforests provide to people will eventually be lost. But because of the reasons for deforestation and its consequences, deforestation can be considered both for the good and for the bad. People unavoidably need timber and farmland just as much as they need clean water. Some people see deforestation as a natural component of economic development where humans must gradually alter the resources they are given for productivity and welfare. Meanwhile, others can only see from the view of the worsening resource base where there can be no control from individuals or the community¹¹. However, deforestation cannot be completely stopped, as it would be impractical to the current populations in the deforested lands. Even mere reduction of deforestation must take into account of political, economic, and environmental issues¹². There must be consideration to the land use of deforested areas, and to the growth that might bring back the once forested land.

For the most part, deforestation is irreversible. Some efforts have been to replant the trees, but this is largely practiced with specific species of trees to replace the original diversity. Also, the reforestation of an area depends on the method of deforestation, the type of land use, frequency of fire, available seeds, and conflicts with other land usage¹³. The disturbances during usage of the deforested area can even have an everlasting effect to the land, causing reforestation

⁶ Moran, 8.

⁷ Allen, Barnes, 175.

⁸ Allen, Barnes, 180.

⁹ Grainger, 34.

¹⁰ Grainger, 37-40.

¹¹ Allen, Barnes, 180-181.

¹² Moran, 2.

¹³ Marin-Spiotta, R. Ostertag, and W.L. Silver, 828.

problems. Even so, the pro of reforestation is that the secondary forest can manage to recover some characteristics of the primary forest in a period of about twenty years¹⁴. However, the con to reforestation as a possible solution is that it will not resolve the resulting cycle of deforestation and reforestation that is bound to occur. People will continue to cut down trees for timber and farmland. They will replant the trees to the damaged area, and it will all happen over and over again through generations.

A better solution to the problem of deforestation is agroforestry. Agroforestry is a concept of combining flora with crops and livestock, thus combining forestry and agriculture for a better method of land use. In Central America, farmers have had the practice of planting plant species along with the hectares of crops, creating their very own mixed tropical forests. In Asia, during deforestation farmers kept some trees that provided canopy from the sun. Based on the history of agroforestry practice, the process might even be a method to maintain the fertility of soil¹⁵. The entire idea of agroforestry puts better use to the deforested land, as well as maintains a good amount of remaining trees for their ecosystem services. If deforestation were put in congruity with agroforestry enough to become a standard practice, much of the trees currently being lost would have a better chance of being preserved. Agroforestry at the same time allows people to cut down trees for timber and farm use, and slows down the process of disrupting the water cycle.

In the Amazon area, where agroforestry would be an important solution to implement, there have been various other benefits from agroforestry due to a government study known as the Pole for Agroforestry Production. Even the people's health and diets have improved from the diverse species of produce¹⁶. However, agroforestry requires a large external investment that might be difficult to sustain. Many countries in the tropics, such as Indonesia or Bangladesh, contain significant amounts of rainforests. However, as developing countries, they do not have the potential to manage such a huge investment. Also, things such as bad choice of plant species, poor management, and even lack of people's motivation may lead to the failure of the huge investment¹⁷, deeming it a possible waste of time and money. This makes agroforestry a risk.

However, agroforestry is a risk that people still must take to manage the destruction of rainforests. People cannot just give up timber, farmland, etc. They cannot entirely stop deforestation and its consequences. However, people can only do what can be done to slow down the process and preserve what of the Earth they can.

¹⁴ Marin-Spiotta, et al, 833.

¹⁵ Nair, 3.

¹⁶ Slinger, 187.

¹⁷ Slinger, 188.

Appendix C: Estimates of rates of deforestation in the humid tropics (million)

<i>Source</i>	<i>Date</i>	<i>Period</i>	<i>Total</i>	<i>Notes</i>
Sommer	1976	1970s	11-15	15 commonly quoted
Myers	1980	1970s	7.5-20	7.5 a later revision
Grainger	1983	1976-80	6.1	cf 7.3 for all tropics
Myers	1989	late 1980s	14.2	—
FAO	1992	1980s	12.2	—

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