4. CO_2 Fertilisation and the Amazon Rainforest

A new study titled "Increasing Tree Size Across Amazonia" has found that trees in the Amazon rainforest are growing larger as a result of rising atmospheric carbon dioxide (CO_2) concentrations.

About the Study

Research Collaboration - Conducted by around 100 scientists from 60 universities and research institutions across South America, Europe, and the United Kingdom. Represents one of the largest and most comprehensive studies on long-term tree growth in the Amazon rainforest.

Duration and Methodology - Observation periods varied by region, with some datasets spanning over 30 years. Researchers used longitudinal measurements of individual trees, including diameter at breast height (DBH), growth rates, and forest composition. Included both mature old-growth forests and areas with secondary regrowth to provide a comprehensive picture.

Key Findings

Increase in Tree Size - Average tree diameter in the Amazon increased by approximately 3.3% per decade. In mature forests, tree size is usually stable, as saplings replace fallen trees. The observed increase suggests an external environmental driver affecting growth.

Attribution to Rising CO_2 - Over the past three decades, atmospheric CO_2 has increased by nearly 20%. The study attributes the enhanced tree growth primarily to carbon fertilisation effect.

Mechanism – Carbon Fertilisation Effect - Higher CO_2 enhances photosynthesis, allowing trees to produce more sugars and grow faster. Accelerates biomass accumulation, resulting in larger trees. Larger trees store more carbon, strengthening the Amazon's role as a global carbon sink.

Significance of the Findings

Enhanced Carbon Absorption - Larger trees absorb more CO_2, partially offsetting global greenhouse gas emissions. Reinforces the Amazon's importance in climate regulation.

Positive but Limited Impact - While CO_2-driven growth provides some compensatory benefit against climate change, it is not sufficient to counterbalance emissions or deforestation. Highlights that relying solely on natural CO_2 fertilisation is inadequate for climate mitigation.

Value of Old-Growth Forests - Mature forests provide irreplaceable ecological services. Benefits of large trees — carbon storage, habitat provision, biodiversity maintenance — cannot be replicated by plantations, which take decades or centuries to achieve similar ecological value.

Ongoing Deforestation Concerns - Despite faster growth due to elevated CO_2, deforestation, degradation, and forest fragmentation threaten the Amazon's carbon storage and ecological functions. Loss of old-growth trees reduces carbon absorption, biodiversity, and climate regulation capacity.

About the Amazon Rainforest

Geographical Spread - Covers nine South American countries -

Brazil - ~60% of the Amazon lies here. Peru, Colombia, Bolivia, Ecuador, French Guiana, Guyana, Suriname, Venezuela.

Size - Covers approximately 5.5 million km², roughly 1% of Earth's land surface.

Ecological Importance -

1. **Biodiversity Hotspot -** Hosts 10% of known wildlife species, including countless endemic plants and animals.
2. **Carbon Storage -** Estimated 150–200 billion tonnes of carbon, making it critical for global climate regulation.
3. **Oxygen Production -** Often called the "lungs of the planet", it absorbs CO_2 and produces oxygen, contributing to atmospheric balance.

Broader Implications

Climate Change Mitigation - Larger Amazon trees enhance carbon sequestration, offering limited natural mitigation against rising greenhouse gases. Emphasizes the importance of protecting old-growth forests as a climate buffer.

Biodiversity Conservation - Mature forests support complex ecosystems that cannot be replaced by tree plantations. Protecting these forests is vital for species survival and ecological balance.

Policy and Conservation - Findings underscore the need for -

1. Stronger forest protection laws.
2. Sustainable land use planning.
3. International cooperation to prevent deforestation.

Highlights that carbon fertilisation is not a substitute for active conservation and emission reduction policies.

Scientific Significance - Confirms the fertilizing effect of CO_2 on tree growth in natural ecosystems. Provides critical long-term data for climate models, forest management, and carbon accounting at a global scale.

Source - https - //indianexpress.com/article/explained/explained-climate/amazon-rainforest-trees-climate-change-10280412/