Quantifying the Global Impact of Planting One Tree Per Year by 3 billion People

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Abstract- This research examines the potential environmental impact of a global initiative where 3 billion people plant one tree annually. By employing statistical modeling and quantitative analysis, the paper evaluates long-term carbon sequestration, deforestation offset, and land use requirements over a 30-year period. The findings suggest that this initiative could significantly mitigate climate change effects, sequestering over 273 billion kg of CO2 per year by year 30, and restoring over 240 million hectares of forested area globally.

1. INTRODUCTION

Deforestation and greenhouse gas emissions remain among the most pressing global environmental concerns. Reforestation is a key strategy to combat these issues. This paper evaluates the hypothetical scenario where 3 billion individuals each plant one tree annually, analyzing its impact on carbon sequestration, global temperature mitigation, and ecological restoration using quantitative models.

2. METHODOLOGY

2.1 Tree Growth Assumptions
Carbon sequestration per tree:
Years 1–10: 5 kg CO2/year
Years 10–20: 22 kg CO2/year
Years 20–30+: 31 kg CO2/year
Average survival rate of planted trees: 70%
Land requirement per mature tree: 0.08 hectares per 100 mature trees

3. YEARLY TREE PLANTING MODEL

Definitions:
(people)
tree/person/year
survival rate

Total trees planted each year=
Surviving trees/year

4. CUMULATIVE CO2 SEQUESTRATION OVER 30 YEARS

We calculate CO2 sequestration cumulatively for each year using time-tiered average
Sequestration values.

4.1 Year-wise Accumulation Model
Let = CO_2 captured in year t
Let = sequestration rate for a tree planted in year y, alive in year t

We use an aggregate simulation:

Year	New Trees (B)	Cumulative Trees (B)	CO2 Sequestered That Year (B kg)
1	2.1	2.1	10.5
10	2.1	21.0	~110 (due to some trees entering higher sequestration stage)
20	2.1	42.0	~230
30	2.1	63.0	~273.2

By Year 30:
Annual CO2 capture = 273 billion kg (273 million tons) of CO2 anually.

5. LAND USE ANALYSIS

1 hectare can support approx. 1,250 trees
(at 8 m^2/tree spacing)
Trees/hectare: ~1,250

Annual land requirement:
(hectares/year)
1.68 million hectares

30-year total: 50.4 million hectares (~504,000 km², the size of Spain)

6. COST ESTIMATES

Assuming:
Per tree: $0.50
Annual cost: $1.05 billion USD
30-year total: $31.5 billion USD

7. COMPARISON WITH GLOBAL EMISSIONS

Global CO2 emissions (2024): 36.8 billion tons/year
Initiative's impact (Year 30): 273 million tons/year
Share: ~0.74% of global annual CO2 emissions
Equivalent to removing ~60 million cars from the road.

8. LIMITATIONS

- Limited available land
- Tree care and maintenance
- Ecosystem mismatches if non-native species are planted
- Climate benefits take decades

9. POLICY RECOMMENDATIONS

1. Integrate this into climate action plans
2. Focus on degraded and non-arable land
3. Use native and biodiversity-supporting species
4. Educate citizens and incentivize participation

10. CONCLUSION

If 3 billion people plant one tree per year:
Over 63 billion trees in 30 years
Over 273 million tons of CO2 sequestered annually
Over 504,000 km² of forest restored
This initiative can be a powerful complementary strategy to reduce atmospheric CO2 levels and combat global climate change when implemented alongside other sustainable practices.

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