Genetically Engineered Trees: No Solution to Global Warming

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As they grow, trees naturally take in carbon from the atmosphere and store it in their tissue. This ability to "sequester" carbon is now being considered as a means to "offset" the C02 emissions from polluting industries to combat global warming. Industry claims the development of monoculture tree plantations will absorb carbon at a faster rate than natural forests and are now looking to fast-growing GE trees as the latest solution. These claims, however, are unsubstantiated. Research actually shows:

• Native forests overall absorb more carbon than plantations;

• Plantations bring many additional problems, including water and nutrient depletion, increased soil salinity and acidity, increased fire risk and biodiversity loss;

• GE trees (e.g. Bt and reduced lignin trees) may exacerbate these problems and will cause novel ones, including alteration of decomposition, insect and disease patterns.

In Brazil, pulp and paper giant Suzano, which manages over 3,000 square kilometers of land in Brazil, is working with the Israel-based biotechnology firm "CBD Technologies," which claims to have identified a gene, called Cellulose Binding Domain (CBD), which accelerates the growth of trees, increasing their carbon sequestration. CBD Technologies Chief Executive Officer (CEO) Seymour Hirsch states, "A one hectare forest consumes 10 tons of carbon annually from the C02 that the trees breathe. Clearly a forest that grows twice as fast consumes twice as much…"[1]

The established myth that forests drastically slow or even stop their carbon sequestration as they mature has been found to be false. Research shows that intact mature forest ecosystems have a net carbon absorption not directly related to the growth of the established forest trees. Undergrowth and natural regeneration additionally contribute to carbon absorption. Forest soils also hold carbon, which is lost into the atmosphere when the forest is logged.

A 1995 report by the World Resources Institute and the US Environmental Protection Agency found that plantations and tree farms in tropical forests at best only store 25% of the carbon absorbed by native forests.[2]

Replacing native forests with plantations does not only remove the carbon stored in the forest and release it into the atmosphere, but will also decrease the overall carbon absorption rate, thus exacerbating global warming rather than mitigating it.

The use of genetically engineered trees as a techno-fix solution to global warming poses a further threat to native forests and their capacity to help balance the global climate.

Fast-growing GE tree plantations maturing in as few as three years are likely to be given higher priority than slower-growing traditional tree plantations. This may explain why corporations such as Royal Dutch Shell have been involved in the genetic engineering of trees.[3]

However, a recent study funded by Duke University's Center on Global Change, the National Science Foundation, the National Institute for Global Environmental Change/Department of Energy, the inter-American Institute for Global Change Research, and others has found that "Growing tree plantations to remove carbon dioxide from the atmosphere to mitigate global warming…could trigger environmental changes that outweigh some of the benefits."

These effects include water and nutrient depletion and increased soil salinity and acidity, said the researchers. "Almost all plantation trees are heavy water using evergreen species such as pines and eucalyptus," said Robert Jackson, a professor in Duke University's Department of Biology and Nicholas School of the Environment and Earth Sciences. The report continued, "Together with nutrient removal, leaf and needle fall from plantation trees can also acidify soils."[4]

Two of the trees receiving the most attention from genetic engineers are eucalyptus and pine. Expanding plantations of faster growing and low-lignin eucalyptus and Bt pines will exacerbate the problems detailed by the Duke University study.

Additional problems with GM trees include: selection pressures for pesticide-resistant insects and disruption of forest ecosystems for which insects are an integral component; damage to soils; lignin-reduction resulting in trees which more easily decompose, thus releasing carbon; and manipulation of disease-resistance causing the creation of increasingly pathogenic viruses.[5] These and other problems inherent with genetically engineered trees will lead to forest health crises that worsen global warming rather than mitigate it.

Global warming itself could determine the effectiveness of the carbon offset plantation model. The carbon sink method could turn out to be a double-edged sword. Plantations have been found to be at high risk of catching fire. In a world of rapidly increasing temperatures and

unpredictable weather, many of the proposed carbon sinks could actually worsen the situation. The Indonesian forest fires of 1997, for example, produced more carbon emissions than did all of the European Union countries together that year.[6]

The Canadian International Development Agency (CIDA) Forestry Advisors Network estimates that in 1950 there were 2.5 billion hectares of tropical forest. By 2000 they estimated that only 2.0 billion remained—a loss of 20%.[7] To return to the carbon sequestering potential of 1950 would require the re-establishment of 500 million hectares of native forest. It is unlikely that the carbon sink values of these vanished forest ecosystems can be replaced by plantations, however large.

The United Nations' Inter-governmental Panel on Climate Change authored a report in February 2001 that supported the idea of carbon offset forestry, but admitted the carbon storage effects would be temporary.

Industry and Northern countries are promoting the idea that it is cheaper to establish plantations on cheap land (in the Global South), than to reduce pollution. In order to ensure "net carbon gain", these lands have to be protected from activities that would compromise their carbon sequestering ability. Thus, resident communities are being displaced until the plantations are mature enough to be logged, even though logging largely defeats the goal of sequestering carbon.[8] In Ecuador, for example, companies are signing contracts with local and indigenous communities to lease their land for 25-99 years, paying the communities US$19 per hectare per year to tend the plantations. If something happens to the plantations that reduces their carbon sequestration levels (such as a fire), the communities will incur substantial debt.

In addition, preservation of forested areas or establishment of plantations displaces local forestry activities (pushing logging or agricultural conversion to other areas)—so defeating the objective of increasing the carbon stored.[9]

Other measures that have to be taken to ensure an overall increase in carbon absorption include:

- fire suppression to avoid loss of carbon;
- stopping decay or disease in trees;
- assurances that funding would not be lost for other forest protection programs;
- ensuring that the promotion of carbon plantations does not slow or prevent the development of technologies for carbon emission reduction;
- forests outside of project boundaries may experience greater threat, for, as the Carbon Storage Trust suggests, "carbon credits for forest protection could become the greatest incentive for deforestation ever conceived.";[10]
- guarantees that carbon credit forestry wouldn't drive up wood/timber prices—a side effect that would result in greater incentives to log elsewhere.[11,12]

As The Corner House and EcoNexus further explain,

"the effect of plantations on erosion and carbon storage of soils downstream would have to be calculated for a century or more. Ways would also have to be found to anticipate and account for possible loss of trees from insect infestation, disease or accident. For carbon credits to have even nominal validity, these predictions would have to be made to be as certain as the prediction that, when fossil fuels are burned, carbon dioxide will be produced. This is a tall order given that even today it remains unclear where all the world's carbon sinks are, how their CO2-fixing capacity works or will be affected by hotter temperatures, and so on..."[13]

In conclusion, carbon offset forestry is designed to allow the Industrialized North to maintain their massively consumptive lifestyle at the expense of the Global South by expanding tree plantations. Genetically engineered trees are not a solution to global warming. If plantations of GE trees spread further into native forests, or if their genetic material contaminates native forests, then genetically engineered trees could lead to accelerated global warming and the continued devastation of the earth's biological diversity.

Genetically engineered trees do not offer a solution to global warming, rather they are a global distraction from finding real solutions to the problems of global warming. In addition, they threaten the world's forests through gene flow and other hazards. This is why people on all continents are raising the call for a global moratorium on the release of genetically modified trees into the environment.

Endnotes

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9. Carbon Storage Trust, "Carbon Offsets in Forestry," Oxford, 1999 p. 12; Smith, J., Mulongoy, K., Persson, R. and Sayer, J., "Harnessing Carbon Markets for Tropical Forest Conservation: Towards a More Realistic Assessment," Center for International Forestry Research, Jakarta, 1998, p. 8

10. Carbon Storage Trust, op. cit. 17, p. 8

11. Smith, J. et. al., op. cit. 17 p. 8.

12. Corner House & EcoNexus, op. cit. 7, pp. 8-10

13. Corner House & EcoNexus, op. cit. 7, p. 9.

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