Global warming: plants are not to blame

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Plants are not to blame for climate change, according to a statement issued this week (18 January) by the researchers who reported eight days ago that plants emit up to a third of the methane — a potent greenhouse gas — in the atmosphere (see The latest threat to the world's climate?).

Surprised by the wave of media attention generated by their study, the authors have hastened to add that because these previously unsuspected methane emissions come from a natural source, they are not the culprits in contemporary climate change.

"They existed long before man's influence started to impact upon the atmosphere," the team write. "The fundamental problem still remaining is the global large-scale burning of fossil fuels."

Following the media interest, Frank Keppler at the Max Planck Institute for Nuclear Physics in Heidelberg, Germany and colleagues received numerous emails from scientists and concerned members of the public. Some asked the team whether it was safe to stand near plants or visit the Amazon rainforest.

Speaking to SciDev.Net, Keppler said he wanted to make three points clear to the public.

First, their findings do not mean that reforestation programmes should be condemned. Trees absorb carbon dioxide, the most important greenhouse gas, so planting them is still beneficial.

When the methane emitted by trees is taken into account, says Keppler, the benefits of planting trees to absorb atmospheric carbon dioxide diminish by just one to four per cent — a negligible effect.

Secondly, changes in the overall amount of methane emitted by plants — including changes that could worsen global warming — are likely to be caused by human activities such as deforestation.

Finally, they say that much more research is needed to discover how methane emissions from plants vary according to species, temperature, humidity, sunlight and other factors, as well as how these emissions might change as the environment does.

"From a scientific point of view, this is fascinating," says Keppler. "We wanted to share this. It could be one piece of the puzzle which is important for the future."

To those who are wondering if they should start chopping down trees, Keppler says they should imagine a world without any trees. "What do we have, then?" he asks.

Read more about carbon sinks in SciDev.Net's dedicated spotlight

Full statement by Frank Keppler et al.

Global warming - the blame is not with the plants

In a recent study (*Nature*, 12 January 2006), scientists from the Max Planck Institute for Nuclear Physics in Heidelberg, Germany, Utrecht University in the Netherlands, and the Department of Agriculture and Rural Development for Northern Ireland, United Kingdom, revealed that plants produce the greenhouse gas methane. First estimates indicated that this could account for a significant proportion of methane in the atmosphere. There has been extended media coverage of this work with unfortunately, in many instances, a misinterpretation of the findings. Furthermore, the discovery led to intense speculations on the potential relevance of the findings for reforestation programmes in the framework of the Kyoto protocol. These issues need to be put in the right perspective.

The most frequent misinterpretation we find in the media is that emissions of methane from plants are responsible for global warming. As those emissions from plants are a natural source, they have existed long before man's influence started to impact upon the composition of the atmosphere. It is the anthropogenic emissions, which are responsible for the well-documented increasing atmospheric concentrations of methane since pre-industrial times. Emissions from plants thus contribute to the natural greenhouse effect and not to the recent temperature increase known as "global warming". Even if land use practices have altered plant methane emissions, which we did not demonstrate, this would also count as an anthropogenic source, and the plants themselves cannot be deemed responsible.

Furthermore, our discovery led to intense speculation that methane emissions by plants could diminish or even outweigh the carbon storage effect of reforestation programs with important implications for the Kyoto protocol, where such programs are to be used in national carbon dioxide (CO2) reduction strategies. We first stress that our findings are preliminary with regard to the methane emission strength. Emissions most certainly depend on plant type and environmental conditions and more experiments are certainly necessary to quantify the process under natural conditions. As a first rough estimate of the order of magnitude we have taken the global average methane emissions as representative to provide a rough estimate of its potential effect on climate. These estimates (for details, see below) show that methane emissions by plants may slightly diminish the effect of reforestation programs. However, the climatic benefits gained through carbon sequestration by reforestation far exceed the relatively small negative effect, which may reduce the carbon uptake effect by up to 4 per cent. Thus, the potential for reduction of global warming by planting trees is most definitely positive. The fundamental problem still remaining is the global large-scale anthropogenic burning of fossil fuels.

Details of calculations used:

In our study, we have linked global methane emission estimates to plant growth, which is generally quantified as net primary productivity (NPP). On a global basis NPP amounts to ~62´(10^15) g of carbon/yr, which corresponds to an uptake of 227´(10^15)g of CO2/yr. On the emission side, our study suggests annual global methane emissions by plants of 62-236 ´(10^12)g/yr methane. Thus, for each kg of CO2 assimilated by a plant roughly 0.25 to 1g of methane is released. During growth of a new forest, up to 50 per cent of plant tissue is lost again in the short term through decomposition of plant litter of leaves and roots [1]. This then doubles the estimate to 0.5 to 2 g methane emitted per kg of CO2 assimilated and stored in plants for longer periods. Over a 100-year horizon, the global warming potential of methane is ~20 times higher than that of carbon dioxide. Thus, for climate, the benefits gained by reforestation programs would be lessened by between 1 and 4 per cent due to methane emissions from the plants themselves.

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Reference:

[1] Schulze, Beck, Muller-Hohenstein; Plant Ecology (Springer Verlag, 2005)

Original work:

Frank Keppler, John T. G. Hamilton, Marc Brass and Thomas Rãckmann
Methane emissions from terrestrial plants under aerobic conditions
Nature, 12 January 2006