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Global Warming - The Blame Is not with the Plants

International scientific team reacts to misinterpretation of their research results and provides the correct perspective

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In a recent study (Nature, 12 January 2006), scientists from the Max Planck Institute for Nuclear Physics, Utrecht University, Netherlands, and the Department of Agriculture and Rural Development for Northern Ireland, UK, 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

Max Planck Society
for the Advancement of Science
Press and Public Relations
Department

Hofgartenstrasse 8
D-80539 Munich

PO Box 10 10 62
D-80084 Munich

Phone: +49-89-2108-1276
Fax: +49-89-2108-1207

E-mail: presse@gv.mpg.de

Internet: www.mpg.de

reforestation programs 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

Responsibility for content:
Dr. Bernd Wirsing (-1276)

Executive Editor:
Dr. Andreas Trepte (-1238)

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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 $\sim 62 \times 10^{15}$ g of carbon/yr, which corresponds to an uptake of 227×10^{15} g of CO_2 /yr. On the emission side, our study suggests annual global methane emissions by plants of $62\text{-}236 \times 10^{12}$ g/yr CH_4 . Thus, for each kg of CO_2 assimilated by a plant roughly 0.25 to 1 to 4 g of CH_4 is released. During growth of a new forest, up to 50% 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 CO_2 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.

**Thomas Röckmann^{1,2}, Jack Hamilton³,
Frank Keppler² and Marc Brass^{1,2}**

¹ Institute for Marine and Atmospheric
Research Utrecht, Utrecht University,
Utrecht, The Netherlands

² Max Planck Institute for Nuclear Physics,
Saupfercheckweg 1, 69117 Heidelberg,
Germany

³ Department of Agriculture and Rural
Development, Agriculture, Food and
Environmental Science Division, Newforge
Lane, Belfast BT9 5PX, UK

Related links:

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

Original work:

Frank Keppler, John T. G. Hamilton, Marc
Brass and Thomas Röckmann

Methane emissions from terrestrial plants under aerobic conditions

Nature, January 12, 2006

[PDF](#) (121 KB)

Contact:

Dr. Frank Keppler

[Max Planck Institute for Nuclear Physics](#), Heidelberg

Tel.: +49 6221 516-575

Fax: +49 6221 516

E-mail: frank.keppler@mpi-hd.mpg.de

Prof. Thomas Röckmann

[Institute for Marine and Atmospheric Research](#), Utrecht, Netherlands

Tel.: +31 30 253-3858

Fax: +31 30 254-3163

E-mail: t.roeckmann@phys.uu.nl

