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Scientists of the German Centre for Forest Ecology assess emissions of the greenhouse gases methane and nitrous oxide

In view of looming climate change, caused by the use of fossil fuels, interest in renewable biofuels has grown again. Whether the use of biofuel crops will benefit the climate, however, depends not just on the extent to which fossil fuels can be replaced. It is equally important how many heat-trapping trace gases are released by producing renewable energies. Worryingly high emissions are, at times, released into the atmosphere from potato and oilseed rape fields. Emissions from poplar plantations, on the other hand, are fairly small. Those were the observations made by Dr. Heiner Flessa, Professor Dr. Friedrich Beese und Dr. Rainer Brumme of the Institute for Soil and Forest Science at the University of Göttingen, in collaboration with scientists from the Institute for Agricultural Chemistry, also at the University of Göttingen, and the Institute for Soil Ecology at the GSF Research Centre for Environment and Health in München-Neuherberg

Over a three year period, they studied the cultivation of potatoes, oilseed rape and poplars under the climate change aspect. The project was funded by the German Federal Environment Agency (Deutsche Bundestiftunt Umwelt), which recently published a detailed scientific report in its publication series 'Environmental Initiatives' (Initiativen zum Umweltschutz).

Those who use renewable raw materials like wood, vegetable oil or bioethanol, do not only protect limited resources. They also emit less carbon dioxide. The amount [of CO₂] released into the atmosphere by renewable biofuels is the same as the plants absorbed organically whilst growing. In order to assess the climate change impact, however, other trace gases have to also be considered. Nitrous oxide (laughing gas, N₂O) and methane are also so-called greenhouse gases: They absorb part of the solar radiation, comparable to the glass panes on a greenhouse, and thus prevent the earth from becoming too cool. At present, methane and nitrous oxide are responsible for around 25% of the man-made additional greenhouse effect.

The soils of the observed agricultural fields take methane out of the atmosphere. They contain microorganisms, which can absorb and metabolise methane. The effects, however, are not significant for the greenhouse gas balance: The annual absorption of methane only comes to a few hundred grams per hectare per year. Nitrous oxide emissions have to be seen in a different light, though. This greenhouse gas is, over a period of a hundred years, 13 times as powerful as methane and 320 times as powerful as carbon dioxide. Nitrous oxide is produced by bacteria which metabolise nitrate and ammonium when oxygen supplies in the soil are reduced. Over-fertilised and over-exploited soils therefore produce quite a lot of this greenhouse gas.

The poplar plantations which were studied release only 0.3 to 0.9 kg of nitrous per hectare per year. Other greenhouse gas emissions which arise from the cultivation and use of poplar as wood fuel are relatively small. During a comparative environmental study scientists compared renewable biomass from poplar with fossil fuel oil for heating. They calculated the amount of oil equivalent to the energy from one hectare of poplar plantations. It was shown that using wood pellets from poplar instead of fossil fuel oil led to considerable reductions in greenhouse gas emissions: One hectare of land produces enough fuel to replace around 14 tons of carbon dioxide.

The greenhouse gas balance is far less favourable when it comes to the cultivation of oilseed rape and potatoes. Firstly, the required production of fertilizers releases a lot of nitrous oxide, and, secondly, the intensively fertilized fields also release large amounts of N₂O. The oilseed rape fields studied produced up to 3.6 kg of nitrous oxide per hectare per year – the potato fields up to 25 kg. Unless those emissions can be reduced, rapeseed methyl-ester can only play a small part – or one at all- in mitigating climate change. The same is true for ethanol from potato starch. It may still make sense to grow oilseed rape and potatoes and biofuel crops for other purposes. In any case, it seems important to keep the emissions of nitrous oxide as low as possible. The scientists also looked at ways to reduce those emissions by protecting the soil and using fertilizers sparsely. They found that, apart from the method of cultivation, other factors, such as location and weather, play an important role. For this reason, the results of the research cannot be easily applied to different conditions or be used as a general model.

Source: <http://www.uni-protokolle.de/nachrichten/id/47351/>