



Direct nitrous oxide emissions from rapeseed in Germany

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The production of first generation biofuels has increased over the last decade in Germany. However, there is a strong public and scientific debate concerning ecological impact and sustainability of biofuel production. The EU Renewables Directive requires biofuels to save 35 % of GHG emissions compared to fossil fuels. Starting in 2017, 50 % mitigation of GHG emissions must be achieved. This presents challenges for production of biofuels from rapeseed, which is one of the major renewable resources used for fuel production. Field emissions of nitrous oxide (N₂O) and GHG emissions during production of fertilizers contribute strongest to the GHG balance of rapeseed biofuel. Thus, the most promising GHG mitigation option is the optimization of nitrogen fertilization.

Since 2012, field trials are conducted on five German research farms to quantify direct GHG emissions. The sites were selected to represent the main rapeseed production regions in Germany as well as climatic regions and soil types. Randomized plot designs were established, which allow monitoring (using manual chambers) impact of fertilization intensity on direct emissions and yield of the typical crop sequence (winter rape – winter wheat – winter barley). The effect of substituting mineral fertilizer with biogas digestate with and without addition of a nitrification inhibitor is also studied.

Here we present results from the first cropping season. In 2013, annual direct N₂O emissions as well as yield normalized N₂O emissions from rape were low. This can be explained with the weather conditions as 2013 was characterized by a cold and long winter with snow until mid spring. As a result, emissions were smaller than predicted by the IPCC emission factors or by the Global Nitrous Oxide Calculator (GNOC). However, emissions still depend on nitrogen input.