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Greenhouse Effect on Public in the Europe

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Brief Report

This special issue deals with the role of managed grasslands as sinks and sources of greenhouse gases (GHG). It presents findings from a European research project (GREENGRASS, EVK2-CT2001-00105). For the first time, a full GHG budget considering the net fluxes of carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) has been established for a range of European grasslands. Seasonal and inter-annual fluctuations in GHG fluxes revealed their sensitivity to climate variability, and comparisons between sites demonstrated the role of agricultural management for the GHG balance of grasslands. Emission factors for N_2O and CH_4 have been refined compared to IPCC default values. Grasslands are important ecosystems as they provide a variety of goods and services to support flora, fauna, and human populations worldwide. Globally, grasslands and pastures contribute to the livelihoods of over 800 million people including many poor smallholders. Livestock use 3.4 billion hectares of grazing land, in addition to about a quarter of the land under crops. By 2020, this agricultural sub-sector will produce about 30% of the value of global agricultural output. In Europe, grassland is one of the dominant forms of land use covering 80 million hectares or 22% of the EU-25 land area.

Most grassland in Europe is managed for feeding domestic herbivores either directly at grazing or through the production of forage, which is stored as hay or silage. The European grassland area is estimated to sustain 150 million cows and 150 million sheep or roughly 15% of the global animal population. Grasslands contribute to the biosphere-atmosphere exchange of radiatively active trace gases, with their fluxes intimately linked to management: Carbon dioxide (CO_2) is exchanged between the atmosphere and soils and vegetation. Grassland soils are large stores of carbon (C) and thus can act as a net sink for atmospheric CO_2 (i.e., C sequestration). It was estimated that the soil organic C sequestration potential of permanent pasture worldwide is between 0.01 and 0.3 Gt C year Nitrous oxide (N_2O) is emitted by fertilized soils and animal waste storage systems. Grasslands are often fertilised to sustain productivity resulting in emissions of N_2O to the atmosphere above the background level that is found in natural systems. Ruminants cause additional N2O emissions from soils and waste management systems in the order of one fourth of the emissions of this greenhouse gas. Methane (CH_4) is emitted by livestock at grazing, and it can be exchanged with the soil. Ruminants contribute to approximately one third of the global anthropogenic emissions of CH_4. Under the Kyoto Protocol (available at www.unfccc.de), biospheric sinks and sources of C can be taken into account in attempts to meet 'Quantified Emission Limitation or Reduction Commitments' (QELRCs) for the first commitment period (2008-2012). In Article 3.4 of the Kyoto Protocol, grazing land management and re-vegetation is included and corresponding soil C sinks (and sources) can therefore be considered.

It was estimated that soil organic C sequestration by the world's permanent pastures could potentially offset up to 4% of the global greenhouse gas emissions. Additionally, reductions in direct emission of N_2O and CH_4 can help parties to meet QELRCs. Parties choosing to include grassland management, grazing land management and re-vegetation must compare the net flux of C from a given activity during the commitment period with the equivalent net flux of C in the baseline year. Similarly, reductions of direct emission of N_2O and CH_4 from grasslands can also be accounted for. Therefore, it is essential that effects of land use and management on the overall Global Warming Potential (GWP) is considered by taking into account all three GHGs concomitantly in an integrated approach [1-5].

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