Estimating future nitrogen fertilizer use in global croplands

J. M. MOGOLLÓN[1], L. LASSALETTA[1,2], A.H.W. BEUSEN[1,2], A.F. BOUWMAN[1,2]

[11]Department of Earth Sciences – Geochemistry, Faculty of Geosciences, Utrecht University, PO Box 80021, 3508 TA Utrecht, The Netherlands

[2] PBL Netherlands Environmental Assessment Agency, P.O.Box 30314, 2500 GH The Hague, The Netherlands

Anthropogenic fixation of reactive nitrogen using the Haber-Bosch process has allowed the global population to exponentially grow since the late 19th century by providing a relatively cheap way of fertilizing agricultural fields. This innovation, however, has also led to an imbalance in the nitrogen cycle, with reactive nitrogen increasing its presence throughout various global reservoirs, leading to the proliferation of algal blooms, water column hypoxia, and the release of nitrous oxide into the atmosphere. In this presentation, I will introduce a simple model that estimates future nitrogen fertilizer use and nitrogen use efficiency in agricultural systems at a global scale. Future projections for crop requirements and fertilizer use are based on 5 socioeconomic pathway scenarios representing (1) sustainability, (2) conventional development, (3) a fragmented world, (4) inequality, and (5) economic growth. Results reveal that in order to stall the continuous increase of fertilizer use in agriculture, nitrogen use efficiencies must significantly increase in the developing world, a situation that can only be achieved by decreasing global fragmentation and increasing global tecnological cooperation.