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Getting the Dimensions Right - Human Nutrition as Key for the Control of Regional Nitrogen Fluxes

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The western society is rested upon a strong animal-based (meat, eggs, milk) nutrition, which is far of a healthy balanced diet. Furthermore, the production of animal based food consumes five to six times more resources (e.g.: area, fertilizer) compared to plant-based food and is closely connected to environmental pollution (e.g.: emission of greenhouse gases, water pollution). Especially the regional nitrogen turnover is highly driven by the request from human nutrition on agricultural production. While the efficiency of the transfer of applied nitrogen into the product is 60 – 70 % for vegetarian food, it is 15 – 25 % for animal based food.

This contribution is going to demonstrate the most important nitrogen fluxes on national scale in Austria calculated using a national material flow analysis. The national nitrogen balance is driven by the production of nitrogen fertiliser and import of fooder. The airborne transport of reactive nitrogen (NO_X and NH_X) plays a decisive role within this balance. The main losses into the environment occur during the agricultural production process. Losses to the atmosphere exceed losses to groundwater and surface waters. After introduction of nitrogen removal at treatment plants, emissions to surface waters are dominated by land use driven fluxes via groundwater. The influence of nitrogen depositions on land (agricultural area, forest and mountain regions) on nitrogen emissions to the water system is in the same order of magnitude as the direct emissions due to fertiliser application – especially in a country as Austria with high shares of mountainous and silvicultural areas. Sources for depositions of reactive nitrogen are mainly NH_3 emissions to the air from animal husbandry and NO_X emissions to the air from traffic. Both substance are matter of transboundary transport and thus are highly influenced by activities outside a specific country or river catchment.

Management of nitrogen on a national or catchment scale has therefore to consider emissions to the air inside and outside the considered region (NH_3 volatilisation from manure and NO_X-emissions from burning processes as traffic) in addition to the direct losses to the water system (optimised fertiliser application). Basically, the key to improved nutrient management on national/catchment scale is the human nutrition. Nutrition of the population in accordance to health recommendations (50 % less meet consumption, contra balanced by an increasing amount of vegetarian food) would dramatically optimise the national nitrogen balance. Assuming the same basic nitrogen efficiency of agricultural as it is performed at present, this shift in production would lead to a dramatic relief in respect to environmental pressure. It would lead to a reduction of the needed nitrogen input (mineral fertiliser and import fooder) by about 40 % and a reduction of NH_3 losses to the atmosphere of about 40 % as well. Assuming that the same reduction of meet production would be realised in neighbouring countries the deposition could be reduced by about 25 %. Finally, this would lead to reduced losses of nitrogen to the water system by about 35 %, which could be counter acted to some extent, if areas no longer needed for food production are used for cultivation of crops for renewable energy production.