Actual and future needed contributions of Sciences and Policy in Germany regarding the implementation not only of the RBMP of the EU-WFD for reducing impact of agricultural losses of the nutrients C, N, P, (S) in river basins / catchments

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Introduction

The EU-WFD (2000) aims the P reduction in surface waters and groundwater, but N reduction together with the EU-Nitrates Directive (1991) and the EU-Groundwater-Directive (2003) only in respect to human health (Methaemoglobinaemia, stomach cancer) with an supposed critical level of 50 mg NO_3^- l^{-1}. But nitrates preserves, rather than threatens human health (e.g. against bacterial infections by dental caries, gastroenteritis, cardiac infection, cardiac vascular disease, hypertension of blood pressure and gastric ulcers) with needed daily adult intakes of 250-1400 ma NO_3 d^{-1}. Furthermore critical N and P loads esp. for coastal and marine waters are more or less neglected, because the impact of the WFD ends only 1 sea mile away from the costal lines. Those dilution strategies like here against eutrophication of coastal and marine waters will fail without crucial loads and levels concepts.

Methods, main results and conclusions

As described in COST 869 with about 100 fact sheets there exist also in Germany similar numerous proposals from sciences to reduce N and P emissions from rural areas to groundwater and surface waters. Since 1983/87 till 1998/2000 the nutrient inputs from agriculture into the surface waters and into the German parts of the seas has decreased related to N only of about -20% and -13% respectively and to P has even increased by +4% and +8% respectively. The shares of agricultural sources in 1998/2000 on total N inputs were 57% and 67% respectively, on total P input 48% and 51% respectively (Behrendt et al. 2003). Since 2000 these N and P inputs into the groundwater and surface waters by agriculture were absolutely more or less the same (German EPA 2000-2008). – The main causes of missing (further) effective reductions in N and P emissions from agriculture and to get developments towards sustainable nutrient balances not only of agriculture but also of the total system nutrition (including also human nutrition) were on the one hand intentional misleading official recommendations esp. in respect to the optimum use of organic fertilizers since the 80ties of former century to maintain a more than 2fold too high animal production (maximum 0.1 AU capita^{-1}) and up to 4fold too high animal densities (maximum 1.0 AU ha^{-1}). On the other hand corresponding agricultural legislations like the German Fertilising Directives (1996-2007) mainly made by the German Ministry for Nutrition, Agriculture and Consumer Protection dominated by Lobby ➔ Lobbyism (➔ Corruption) of e.g. these officials, farmers organizations, nutrition involved industries etc. to maintain these actual non sustainable nutrient balances, esp. of C, N, P. Additionally actual N surplus of German agriculture increases from 106 kg N ha^{-1} yr^{-1} in 2001/2003 to 159 kg N ha^{-1} yr^{-1}considering not only N inputs but also the N deliveries by additional atmospheric deposition (+13 kg N ha^{-1} yr^{-1}) and esp. by net mineralization through change from grassland to arable land (+29 kg N ha^{-1} yr^{-1}) and cultivation of moor land/fens (+11 kg N ha^{-1} yr^{-1}) (Isermann 2009). The production of biomass (esp. bioenergy) will furthermore increase N and P surpluses of agriculture.

But there are also needs and corresponding (inter-)national and worldwide perspectives in the development of sustainable nutrient balances, not only sectional within agriculture but by a holistic approach for the total systems like here multi-sectional and multi-medium scaled C-, N-, (P-), S-balances for the systems nutrition and biomass (esp. bioenergy). Initiated by Agenda 21 of Rio (1992) and enforced by the EU Strategy for Sustainable Development (2001/2005) Germany starts with a "National Strategy for Sustainability as Perspectives (2002)" and "The Report on Sustainability Indicators (2008)" referring 8 of 21 indicators for "Sustainable Land and Soil Use". One indicator is an unrealistic N surplus for agriculture (farm gate balance) in 2010 of 80 kg N ha^{-1} yr^{-1} but a realistic one of 50 kg N ha^{-1} yr^{-1} in 2020. Therefore needed land use managements and their implementations are shown here. Correspondingly German EPA developed a multi-medium and multi-system strategy for the needed reductions of N emissions (2008).

Both EU and National German Marine Strategy (2008) aimed good chemical status in coastal waters (also nutrients) at least within the zone of 12 sea miles from the coastal lines. Therefore the average maximum tolerable critical nutrient levels and loads of the streams are only about 2fold higher than their (natural) background (BG) values. This is corresponding in Germany to 2x CBG_N = 1.42 mg TN l^{-1} and 2x IBG_N = 186 740 t TN yr^{-1} respectively and 2x CBG_P = 0.068 mg TP l^{-1} and 2x IBG_P = 7 156 t TP yr^{-1} respectively (LAWA 1998, Behrendt et al. 2003). –EUROSOIL (2008) shows about 500 indicators referring to sustainable land and soil use, especially in respect to the 11 main threats on soils, 10 of these are essentially caused by agriculture and 5 by their emissions of C, N, P, S. – Partly initiated by BSNLC the following (inter-)national Working Groups (WG) and worldwide activities are actually involved in Sustainable Land Use mainly in respect to the nutrients C, N, P, S:

1. Germany: Association of German Agricultural Analytical and Research Institutes with "WG Sustainable Nutrient Balances in rural Areas" and a.o. "WG Precision/ Optimization of humus balances"; DWA: "WG Sustainable water management in respect of (the fate) of C, N, P, S in the hydrosphere; German Society of Soil Sciences "WG: Sustainable land and soil use".
2. International: WG for long-term field experiments; WG of Soil Fertility; both within IUSS; "WG Lysimeter".
3. Worldwide: IAASTD (2008): "Agriculture and Sustainable Development"; Institute of Sustainable Futures, University of Technology, Sydney (Dana Cordell): "Sustainable future in phosphorus flows".

There is a general agreement that without the optimization of humus (C) balances in agriculture there is also no optimization of N, P and S balances with the nutrition and biomass systems. This should also be accepted by COST 869.