

European Nitrogen Assessment

Chapter 16: Integrating nitrogen fluxes at the European scale

Supplementary Material: Section B- Tentative Nitrogen Budget for Europe (EU27) in the year 1900.

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For the sake of comparison with the European nitrogen budget established in this chapter for EU27 in the present time, a reconstitution has been made of the Nitrogen budget as it was over the same geographical space at the very beginning of the 20th century (Fig. 16. SB1)

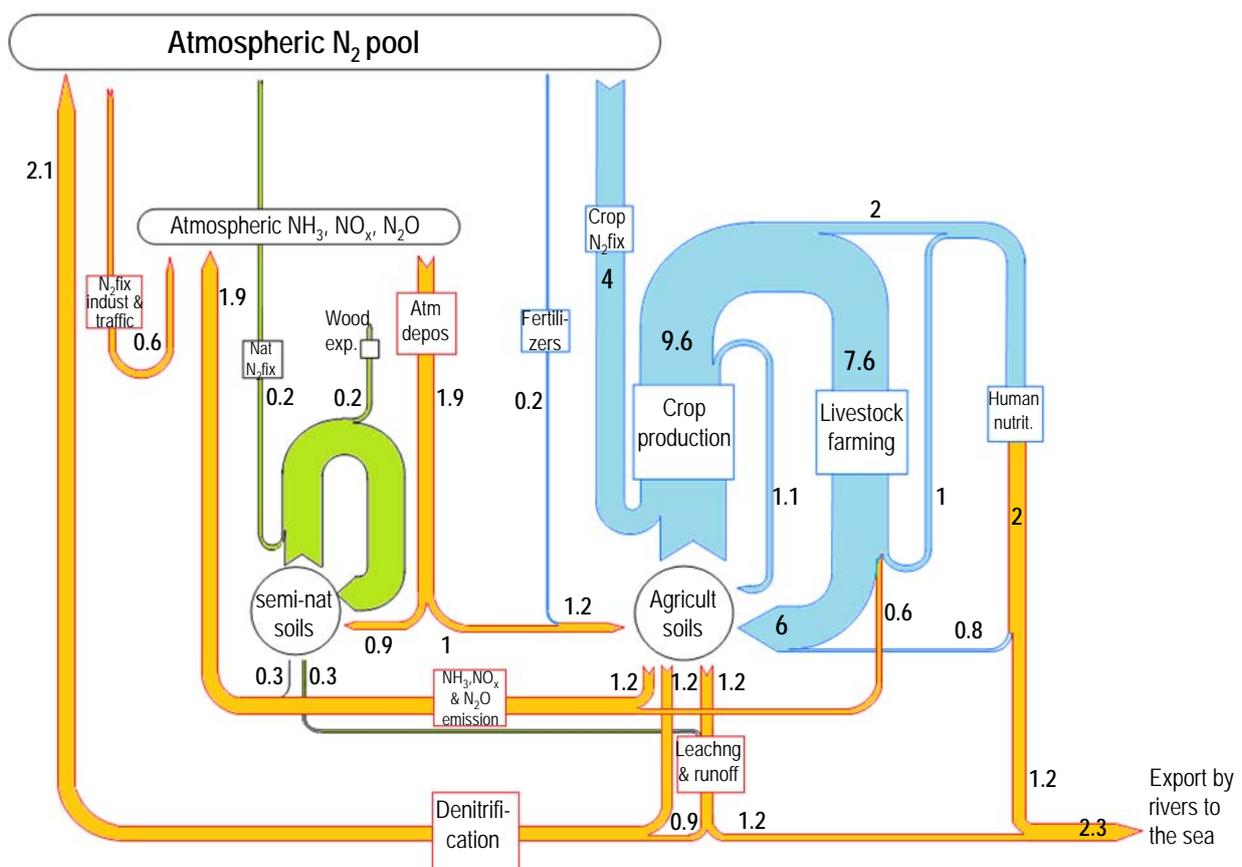


Figure 16.SB1. The nitrogen budget of the current EU27 territory reconstituted for the period around 1900. Fluxes are in TgN/yr.

Figures related to emissions of Nr by industry and to atmospheric deposition are derived from Hurr et al. (2009) and have been discussed in Supplementary Material to ENA Chapter 5 (this volume).

Figures concerning agriculture and the fate of Nr in cultivated soils are derived from the work of Bouwman et al. (2011) and van Dreht (2003). The estimated aggregate population of the countries currently forming EU27 was estimated to about 325 million inhabitants in the

beginning of the 20th century. This led to a value of 1.8 TgN/yr for human food consumption, considering an annual intake of 5.5 kgN/cap/yr, with about one third as animal proteins (Billen et al., 2009). At that time most of Europe depended on traditional forms of agriculture based on complementary crop cultivation and livestock farming, with biennial (in the south) or triennial (in the north) crop rotations. Use of inorganic fertilizer (mainly Chile saltpetre) was marginal and manure was the main way to ensure fertilization of cereal cropland. Biological N₂ fixation by grazed semi-natural or managed grassland was therefore the main source of reactive nitrogen introduction into the agricultural system. During the 19th century, in the most fertile European areas, the triennial cultivation of a legume fodder crop had replaced the grazed fallow, leading to an increase in livestock numbers, hence an increase in manure resources and much improved cereal yields. The total agricultural production was estimated to 9.6 TgN/yr. In the budget of Fig. 16.S1, the agricultural biological N₂ fixation has been evaluated to 4 TgN from the balance of the soil nitrogen budget. This value is nearly 3 times higher than the crop N₂ fixation of modern agriculture.

As a whole, Europe could be considered self sufficient in terms agricultural products and net commercial exchanges with the rest of the world have been neglected in our budget (although imports of grain from North America were probably significant).

From the budget, the estimated riverine export of nitrogen to the European coastal seas in 1900 should have been about 2.3 TgN/yr, i.e. half the current export value.

References

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