

European Nitrogen Assessment

Chapter 5: The challenge to integrate nitrogen science and policies.

Supplementary Material: Basis of estimated trends.

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Table 5.S1: Trend of inputs and emissions of N_r in EU-27 1900-2000 (supporting Figure 5.1)

	1900	1950	1980	2000	ENB 2000 ¹
Major N_r inputs	Tg/yr N				
N ₂ fix by industry and traffic	0.63	1.71	5.29	4.33	3.70
imported feed & food	0.00	1.00	3.50	3.50	3.50
fertiliser application	0.24	1.57	14.00	11.35	11.20
crop N ₂ fixation	4.00	2.75	1.50	1.50	1.30
Major N_r emissions					
NO _x emission	0.57	1.61	5.29	3.82	3.54
NH ₃ emission	1.41	1.81	4.29	3.50	3.17
N ₂ O emission	0.43	0.46	1.12	0.74	1.04
N _r to water	2.60	4.11	9.14	7.41	8.29
Denitrification (soils)	1.27	1.99	5.51	5.22	5.48
Total inputs	4.87	7.03	24.29	20.68	19.70
Total emissions	6.28	9.98	25.34	20.69	21.51

¹ The value estimated for the European Nitrogen Budget by Leip et al. (2011, Chapter 16 this volume) is shown for comparison with the trends estimated here.

The values show in the first columns (1900, 1950, 1980, 2000) in Table 5.S1 are inputs of N_r to and emissions of N_r from the economic (or human) system. Not all inputs and outputs are accounted for and the data do not therefore present a closed N balance. The estimates for the year 2000 are therefore slightly differ to those used for the European Nitrogen Budget for 2000, see Leip et al. (2011 Chapter 16 this volume), because different data sources were used to reconstruct a consistent time trend between 1900 and 2000. For the background to the estimates for 1900, see the supporting material to Leip et al. (2011, Chapter 16 this volume).

The following points should be noted concerning the estimates provided in Table 5.S1:

- **N₂ fixation by industry and traffic.** For emissions from fossil fuel energy and industry, the data are based on an emission inventory made for the historical emission pathways and new scenarios for climate research ('Representative Concentration Pathways'; Hurtt et al., 2009).
- **Imported feed & food.** The values for 2000 is based on Eurostat statistics for trade (which are comparable with FAO-stat) and CAPRI model assumptions about N-content in various feed, food and fiber commodities (Leip et al., 2011, Chapter 16 this volume). The CAPRI model assumes N contents of 2.4% for cereals, 5% for protein-rich feedstuff and 7.5% for processed feedstuff (feed 'cakes'). As a first estimate, the value for 1980 is based on that for 2000. The value for 1950 is an inferred estimate based on FAO-stat data for commodity trading between 1960 and 2007. Net feed import was assumed to be zero in 1900.

- **Fertiliser application.** Estimates for the years 1950 and 1980 are based on EFMA (2009).
- **Crop biological N₂ fixation.** The value for 1980 is assumed to be the same as for 2000 (1.5 Tg). The value for 1900 is inferred from food balance, assuming a total human N-consumption of about 1 Tg for a human population of 325 million and an annual N-intake per person of 3.4 kg, of which about 75% is estimated to have come from crops. The estimated value for 1950 is simply the mean of the estimates for 1900 and 1980, also assuming that in 1950 there was still a substantial area of unfertilized and little-fertilized clover-rich grasslands.
- **Emissions NO_x and NH₃.** The estimates for 1980-2000 are based on the EMEP database (Tarrason and Nytri, 2008; Acid News, 2008). The estimates for 1900 and 1950 are taken from Hurtt et al. (2009).
- **Leaching and runoff.** The estimates for 1900, 1950 and 1980 based on the model developed by van Drecht et al. (2003), with historical land use data presented by Bouwman et al. (2011).

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