

Table 27. U.S. Nitrous Oxide Emissions from Nitrogen Fertilization of Agricultural Soils, 1990 and 1995-2003
 (Thousand Metric Tons Nitrous Oxide)

Source	1990	1995	1996	1997	1998	1999	2000	2001	2002	P2003
Thousand Metric Tons Nitrous Oxide										
Direct Emissions										
Nitrogen Fertilizers	179	173	159	159	161	161	154	150	154	155
Animal Manure	4	5	4	4	4	4	4	4	4	4
Crop Residues	94	94	106	114	117	113	116	116	111	109
Soil Mineralization.....	10	10	10	10	10	11	11	11	11	11
Biological Fixation in Crops....	171	179	178	187	194	193	191	195	182	176
Sewage Sludge.....	1	1	1	1	1	1	1	1	2	2
Total Direct Emissions	459	461	459	475	486	482	476	476	461	456
Indirect Emissions										
Soil Leaching	123	119	109	110	110	111	106	103	106	107
Atmospheric Deposition	22	21	20	20	20	20	19	18	19	19
Total Indirect Emissions ...	144	140	129	129	130	130	125	122	125	126
Total	604	601	587	604	616	613	601	598	586	581
Million Metric Tons Carbon Dioxide Equivalent										
Direct Emissions										
Nitrogen Fertilizers	53.1	51.2	47.1	47.2	47.5	47.7	45.6	44.4	45.6	46.0
Animal Manure	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Crop Residues	27.9	27.8	31.4	33.8	34.5	33.5	34.4	34.4	32.7	32.4
Soil Mineralization.....	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Biological Fixation in Crops....	50.7	53.1	52.8	55.2	57.3	57.2	56.4	57.6	53.8	52.0
Sewage Sludge.....	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
Total Direct Emissions	135.9	136.5	135.7	140.6	143.8	142.8	140.8	140.9	136.6	134.8
Indirect Emissions										
Soil Leaching	36.3	35.2	32.4	32.4	32.6	32.8	31.3	30.6	31.4	31.6
Atmospheric Deposition	6.5	6.3	5.8	5.8	5.8	5.8	5.6	5.5	5.6	5.6
Total Indirect Emissions ...	42.8	41.4	38.2	38.2	38.5	38.6	36.9	36.0	37.0	37.3
Total	178.6	178.0	173.9	178.9	182.2	181.4	177.7	176.9	173.5	172.1

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2002*, DOE/EIA-0573(2002) (Washington, DC, October 2003). Totals may not equal sum of components due to independent rounding.

Sources: Estimates presented in this chapter. Emissions coefficients from Intergovernmental Panel on Climate Change, *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3 (Paris, France, 1997), pp. 4.89-4.107, web site www.ipcc.ch/pub/guide.htm. Total nitrogen content of U.S. commercial fertilizer consumption—1988-1994, Tennessee Valley Authority; 1995-2002, Association of American Plant Food Control Officials, *Commercial Fertilizers* (Washington, DC, various years). Manure application based on cattle population data provided by the U.S. Department of Agriculture, National Agricultural Statistics Service, web sites www.usda.gov/nass/pubs/histdata.htm and www.nass.usda.gov/ipedbl/. Typical animal sizes from U.S. Environmental Protection Agency, Office of Air and Radiation, *Anthropogenic Methane Emissions in the United States: Estimates for 1990* (Washington, DC, April 1993), p. 6-8. Manure production and waste management systems used from L.M. Saffey, M.E. Casada et al., *Global Methane Emissions From Livestock and Poultry Manure* (Washington, DC, February 1992), and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2002*, EPA-430-R-04-003 (Washington, DC, April 2004), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2004.html>.