

Table 26. U.S. Nitrous Oxide Emissions from Nitrogen Fertilization of Agricultural Soils, 1990-2002
 (Thousand Metric Tons Nitrous Oxide)

Source	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	P2002
Thousand Metric Tons Nitrous Oxide													
Direct Emissions													
Nitrogen Fertilizers	179	182	183	193	195	173	159	159	161	161	154	150	153
Animal Manure	4	4	5	5	5	5	4	4	4	4	4	4	4
Crop Residues	94	91	105	86	113	94	106	114	117	113	116	116	110
Soil Mineralization.....	10	10	10	10	10	10	10	10	10	11	11	11	11
Biological Fixation in Crops....	171	174	173	165	187	179	178	187	194	193	191	195	181
Sewage Sludge.....	1	1	1	1	1	1	1	1	1	1	1	1	2
Total Direct Emissions.....	459	462	476	458	510	461	459	475	486	482	476	476	459
Indirect Emissions													
Soil Leaching	123	125	126	132	134	119	109	110	110	111	106	103	105
Atmospheric Deposition	22	22	22	23	24	21	20	20	20	20	19	18	19
Total Indirect Emissions ...	144	147	148	155	157	140	129	129	130	130	125	122	124
Total.....	604	609	624	613	667	601	587	604	616	613	601	598	583
Million Metric Tons Carbon Dioxide Equivalent													
Direct Emissions													
Nitrogen Fertilizers	53	54	54	57	58	51	47	47	48	48	46	44	45
Animal Manure	1	1	1	1	1	1	1	1	1	1	1	1	1
Crop Residues	28	27	31	25	33	28	31	34	35	33	34	34	33
Soil Mineralization.....	3	3	3	3	3	3	3	3	3	3	3	3	3
Biological Fixation in Crops....	51	51	51	49	55	53	53	55	57	57	56	58	54
Sewage Sludge.....	*	*	*	*	*	*	*	*	*	*	*	*	*
Total Direct Emissions.....	136	137	141	136	151	137	136	141	144	143	141	141	136
Indirect Emissions													
Soil Leaching	36	37	37	39	40	35	32	32	33	33	31	31	31
Atmospheric Deposition	6	7	7	7	7	6	6	6	6	6	6	5	6
Total Indirect Emissions ...	43	43	44	46	47	41	38	38	38	39	37	36	37
Total.....	179	180	185	182	197	178	174	179	182	181	178	177	173

*Less than 0.5 million metric tons carbon dioxide equivalent.

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 2001*, DOE/EIA-0573(2001) (Washington, DC, December 2002). 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/ipedb/. 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. Safley, 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 1990-2001*, EPA-430-R-03-004 (Washington, DC, April 2003), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2003.html>.