



Appendix B

Data Underlying Nitrous Oxide Emissions from Agricultural Soils

This appendix presents the data used to calculate the manure-N excretion and N₂O emission factors in Table B-1. N₂O emissions from different Animal Waste Management Systems in different regions of the world are in Table B-2.



TABLE B-1
CALCULATION OF MANURE-N EXCRETION AND N₂O EMISSION FACTORS FOR DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS. THESE ARE TO BE REPORTED UNDER MANURE MANAGEMENT, EXCEPT FOR DAILY SPREAD AND PASTURE RANGE OF PADDOCK (EMISSIONS FROM AGRICULTURAL SOILS) AND EMISSIONS AFTER USE AS A FUEL (ENERGY)

Region	Type of Animal	Number of animals (x10 ⁶)	Nitrogen excretion kg (N/animal/yr)	Emission Factor for AVMs EF ₃ (% of Manure N Excreted that is lost as N ₂ O)							Total N Excreted (Tg N)	
				Anaerobic Lagoon (EF ₃)	Liquid Systems (EF ₃)	Daily Spread (EF ₃)	Solid Storage & Drylot (EF ₃)	Pasture range Paddock (EF ₃)	Used Fuel (EF ₃)	Other System (EF ₃)		
North America	Non-dairy Cattle	99.199	70	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	6.9
	Dairy Cattle	16.521	100	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	1.7
	Poultry (E)	1486.266	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.9
	Sheep	11.336	16	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.2
	Swine	66.146	20	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	1.3
Western Europe	Other animals (F)	6.067	25	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.2
	Non-dairy Cattle	56.618	70	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	4.0
	Dairy Cattle	31.099	100	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	3.1
	Poultry (E)	880.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.5
	Sheep	93.856	20	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	1.9
Eastern Europe	Swine	114.959	20	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	2.3
	Other animals (F)	31.578	25	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.8
	Non-dairy Cattle	101.447	50	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	5.1
	Dairy Cattle	56.800	70	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	4.0
	Poultry (E)	1667.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	1.0
	Sheep	188.159	16	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	3.0
	Swine	152.757	20	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	3.1
	Other animals (F)	21.558	25	0.1	0.1	0.0	2.0	2.0	0.0	0.0	0.5	0.5

TABLE B-1 (CONTINUED)

CALCULATION OF MANURE-N EXCRETION AND N₂O EMISSION FACTORS FOR DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS. THESE ARE TO BE REPORTED UNDER MANURE MANAGEMENT, EXCEPT FOR DAILY SPREAD AND PASTURE RANGE OF PADDOCK (EMISSIONS FROM AGRICULTURAL SOILS) AND EMISSIONS AFTER USE AS A FUEL (ENERGY)

Region	Type of Animal	Number of animals (x 10 ⁶)	Nitrogen excretion kg (N/animal/yr)	Emission Factor for AWMs EF ₃ (% of Manure N Excreted that is lost as N ₂ O)							Total N Excreted. (Tg N)
				Anaerobic Lagoon (EF ₃)	Liquid Systems (EF ₃)	Daily Spread (EF ₃)	Solid Storage & Drylot (EF ₃)	Pasture range Paddock (EF ₃)	Used Fuel (EF ₃)	Other System (EF ₃)	
Oceania	Non-dairy Cattle	27.610	60	0.1	0.1	0.0	2.0	2.0	0.0	0.5	1.7
	Dairy Cattle	4.441	80	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.4
	Poultry (E)	71.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.0
	Sheep	228.982	20	0.1	0.1	0.0	2.0	2.0	0.0	0.5	4.6
	Swine	5.003	16	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.1
Latin America	Other animals (F)	2.579	25	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.1
	Non-dairy Cattle	272.871	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	10.9
	Dairy Cattle	37.560	70	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.6
	Poultry (E)	1259.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.8
	Sheep	117.312	12	0.1	0.1	0.0	2.0	2.0	0.0	0.5	1.4
Africa	Swine	78.150	16	0.1	0.1	0.0	2.0	2.0	0.0	0.5	1.3
	Other animals (F)	71.699	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.9
	Non-dairy Cattle	133.198	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	5.3
	Dairy Cattle	18.734	60	0.1	0.1	0.0	2.0	2.0	0.0	0.5	1.1
	Poultry (E)	646.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.4
	Sheep	179.171	12	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.2
	Swine	12.445	16	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.2
	Other animals (F)	162.194	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	6.5



TABLE B-1 (CONTINUED)

CALCULATION OF MANURE-N EXCRETION AND N₂O EMISSION FACTORS FOR DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS. THESE ARE TO BE REPORTED UNDER MANURE MANAGEMENT, EXCEPT FOR DAILY SPREAD AND PASTURE RANGE OF PADDOCK (EMISSIONS FROM AGRICULTURAL SOILS) AND EMISSIONS AFTER USE AS A FUEL (ENERGY)

Region	Type of Animal	Number of animals (x 10 ⁶)	Nitrogen excretion kg N/animal/yr	Emission Factor for AWMs EF ₃ (% of Manure N Excreted that is lost as N ₂ O)							Total N Excreted (Tg N)
				Anaerobic Lagoon (EF ₃)	Liquid Systems (EF ₃)	Daily Spread (EF ₃)	Solid Storage & Drylot (EF ₃)	Pasture range Paddock (EF ₃)	Used Fuel (EF ₃)	Other System (EF ₃)	
Near East and Mediterranean	Non-dairy Cattle	44.562	50	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.2
	Dairy Cattle	17.174	70	0.1	0.1	0.0	2.0	2.0	0.0	0.5	1.2
	Poultry (E)	656.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.4
	Sheep	187.502	12	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.3
	Swine	0.174	16	0.1	0.1	0.0	2.0	2.0	0.0	0.5	0.0
	Other animals (F)	81.962	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	3.3
Asia and Far East	Non-dairy Cattle	440.398	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	17.6
	Dairy Cattle	45.240	60	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.7
	Poultry (E)	3949.000	0.6	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.4
	Sheep	202.442	12	0.1	0.1	0.0	2.0	2.0	0.0	0.5	2.4
	Swine	403.231	16	0.1	0.1	0.0	2.0	2.0	0.0	0.5	6.5
	Other animals (F)	293.700	40	0.1	0.1	0.0	2.0	2.0	0.0	0.5	11.7
World Total											135.3

(D) Includes buffalo

(E) Includes chickens, turkeys and ducks

(F) Includes goats, horses, mules, donkeys and camels

**TABLE B-2
N₂O EMISSIONS FROM DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS**

Region	Type of Animal	N ₂ O Emission from Waste Management Systems (GgN)										Total N ₂ O Emission (Gg N)	
		Liquid System	Daily Spread	Solid Storage and Drylot	Pasture Range and Paddock	Used Fuel	Other System	Total AWMS					
North America	Non-dairy Cattle	0	0	19	117	0	0	0	137				137
	Dairy Cattle	0	0	0	0	0	1	0	9				9
	Poultry (E)	0	0	0	0	0	4	0	4				4
	Sheep	0	0	0	3	0	0	0	3				3
	Swine	0	0	5	0	0	0	0	6				6
	Other animals (F)	0	0	0	3	0	0	0	3				3
Western Europe	Non-dairy Cattle	0	0	2	26	0	2	0	32				32
	Dairy Cattle	0	0	13	5	0	0	0	20				20
	Poultry (E)	0	0	0	0	0	2	0	3				3
	Sheep	0	0	1	33	0	1	0	34				34
	Swine	0	0	11	0	0	0	0	12				12
	Other animals (F)	0	0	0	15	0	0	0	15				15
Eastern Europe	Non-dairy Cattle	0	0	53	0	0	0	0	55				55
	Dairy Cattle	0	0	53	10	0	0	0	64				64
	Poultry (E)	0	0	0	0	0	4	0	4				4
	Sheep	0	0	0	44	0	4	0	48				48
	Swine	0	0	0	16	0	7	0	24				24
	Other animals (F)	0	0	0	10	0	0	0	10				10



TABLE B-2 (CONTINUED)
N₂O EMISSIONS FROM DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS

Region	Type of Animal	N ₂ O Emission from Waste Management Systems (GgN)										Total AWMS	Total N ₂ O Emission (GgN)
		Liquid System	Daily Spread	Solid Storage and Drylot	Pasture Range and Paddock	Used Fuel	Other System	Total AWMS	Total N ₂ O Emission (GgN)				
Oceania	Non-dairy Cattle	0	0	0	33	0	0	0	33	0	0	33	33
	Dairy Cattle	0	0	0	7	0	0	0	7	0	0	7	7
	Poultry (E)	0	0	0	0	0	0	0	0	0	0	0	0
	Sheep	0	0	0	92	0	0	0	92	0	0	92	92
	Swine	0	0	0	0	0	0	0	0	0	0	0	0
	Other animals (F)	0	0	0	1	0	0	0	1	0	0	1	1
Latin America	Non-dairy Cattle	0	0	0	216	0	0	0	216	0	1	217	217
	Dairy Cattle	0	0	1	19	0	0	0	19	0	0	19	19
	Poultry (E)	0	0	0	6	0	0	0	6	0	2	8	8
	Sheep	0	0	0	28	0	0	0	28	0	0	28	28
	Swine	0	0	13	0	0	0	0	0	0	3	15	15
	Other animals (F)	0	0	0	57	0	0	0	57	0	0	57	57
Africa	Non-dairy Cattle	0	0	3	102	0	0	0	102	0	0	105	105
	Dairy Cattle	0	0	0	19	0	0	0	19	0	0	19	19
	Poultry (E)	0	0	0	6	0	0	0	6	0	0	7	7
	Sheep	0	0	0	43	0	0	0	43	0	0	43	43
	Swine	0	0	4	0	0	0	0	0	0	0	4	4
	Other animals (F)	0	0	0	128	0	0	0	128	0	0	129	129

TABLE B-2 (CONTINUED)
N₂O EMISSIONS FROM DIFFERENT ANIMAL WASTE MANAGEMENT SYSTEMS IN DIFFERENT WORLD REGIONS

Region	Type of Animal	N ₂ O Emission from Waste Management Systems (Gg N)										Total N ₂ O Emission (Gg N)
		Anaerobic Lagoon	Liquid System	Daily Spread	Solid Storage and Drylot	Pasture Range and Paddock	Used Fuel	Other System	Total AWMS			
Near East and Mediterranean	Non-dairy Cattle	0	0	0	0	34	0	0	0	0	0	35
	Dairy Cattle	0	0	0	1	19	0	0	0	0	0	19
	Poultry (E)	0	0	0	0	6	0	0	1	0	0	6
	Sheep	0	0	0	0	45	0	0	0	0	0	45
	Swine	0	0	0	0	0	0	0	0	0	0	0
Asia and Far East	Other animals (F)	0	0	0	0	66	0	0	0	0	0	66
	Non-dairy Cattle	0	0	0	49	102	0	0	0	0	0	151
	Dairy Cattle	0	0	0	0	13	0	0	0	0	0	13
	Poultry (E)	0	0	0	0	21	0	0	6	0	0	27
	Sheep	0	0	0	0	40	0	0	2	0	0	42
World Total	Swine	0	0	0	68	0	0	0	0	0	0	71
	Other animals (F)	0	0	0	0	223	0	0	3	0	0	226
						1609						1971

(D) Includes buffalo

(E) Includes chickens, turkeys and ducks

(F) Includes goats, horses, mules, donkeys and camels



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