(KEEP THIS WORKSHEET FOR RECORDS!)

Ammonia Emissions Estimator

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Caution: This worksheet provides an approximation of ammonia emission based upon currently available information. There is likely to be significant variations with region of the country, climate, and management of the production or storage system. These values are also likely to change with additional research on ammonia emissions.

Farm Name: _____

Animal species and production stage[1]	Average capacity (number of animals)

Step 1: Estimate % ammonia loss[2] from:

Animal housing: _____% (Table 1) Describe housing:_____

Manure storage: _____% (Table 2) Describe storage:_____

Step 2. Estimate % ammonia loss from the animal housing and storage system

Ammonia Loss (%) = Housing % Loss + [(100 – Housing % Loss) X Storage % Loss / 100]

Ammonia Loss (%) = _____ + [(100 – _____) X _____ / 100]

Ammonia Loss (%) = _____ %

Step 3. Identify the animal species row in Table 3 (along left side) that is most relevant to this estimation, and the ammonia loss (%) column (across the top) that best matches the estimated ammonia loss from Step 2. Find where this row (appropriate species) and this column (appropriate ammonia loss) intersect and record this value:

Unit ammonia loss = _____ lbs / animal / day.

Step 4. Estimate daily herd/flock ammonia loss

Daily herd ammonia loss = Average capacity X Unit ammonia loss (Step 3)

Daily herd ammonia loss = _____ animals X _____lbs / animal / day

Daily herd ammonia loss = _____ lbs ammonia per day

Step 5. Estimate annual herd/flock ammonia loss

Annual herd ammonia loss = Daily herd ammonia loss X Days per year facility is occupied

Annual herd ammonia loss = _____lbs/day X _____days/year

Annual herd ammonia loss = _____ lbs ammonia per year

Table 1. Typical ammonia losses from animal housing facilities expressed as a percentage of excreted manure nitrogen.[3]

Facility Description	Applicable Species	% Loss	Facility Description	Applicable Species	% Loss
Open dirt lots (cool, humid region) Open dirt lots (hot, arid region)	Beef	30 - 45 40 – 60	Roofed facility (stacked manure under floor…includes storage loss)	Egg producing birds	25 - 50
Open dirt lots (cool, humid region) Open dirt lots (hot, arid region)	Dairy	15 - 30 30 - 45	Roofed facility (bedded pack)	Swine, beef, and dairy	20 - 40
Roofed facility (flushed or scraped) Roofed facility (daily scrape and haul)	Dairy Swine	5 - 15	Roofed facility (litter)	Meat producing birds	25 - 50
Roofed facility (shallow pit under floor)	Swine Dairy	10 - 20	Roofed facility (deep pit under floor…includes storage loss)	Swine, beef, dairy	30 - 40

[1] If more than one species, production stage, housing system or manure handling system is present on a given site, perform Steps 1-5 for each species, stage and/or system and sum resulting emissions.

[2] If an ammonia loss range is given, you may want to estimate loss for low and high values.

[3] Most estimates are from USDA NRCS Agricultural Waste Management Field Handbook and LPES Lesson 21: Manure Storage Structures.

Table 2. Typical ammonia losses from manure storage as a percentage of nitrogen entering facility.[2]

Facility Description	% Loss	Facility Description	% Loss
Temporary stacked manure (no turning)	10-20	Pit below slatted floor (included in Table 1 values)	0
Composted manure (no carbon amendment)	30 to 40	Earthen storage pit (minimal treatment)	20 – 35
Composted manure (significant carbon amendment)	5 to 10	Formed manure storage (bottom loaded)	10
Bedded Pack Manure (included in Table 1 values)	0	Formed manure storage (top loaded)	30
Runoff holding pond (precipitation runoff only)[3]	2 - 3	Anaerobic Lagoon (significant treatment)*	65-75

* Much of the lagoon loss can be due to denitrification (N_2 and N_2O), so the ammonia loss may only be half of what is shown.

Table 3. Estimates of ammonia nitrogen losses. Excretion estimates based upon 2005 ASAE Standard (proposal) for typical animals.

Livestock and Poultry Species	Typical Nitrogen Excretion (lbs per animal per day)	Ammonia Loss (% of excreted nitrogen) 10%	20%	30%	40%	50%	60%	70%	80%	90%
		--Estimated Ammonia Loss (lbs per animal per day)…converts N to NH_3 by multiplying by 1.21--								
Beef-Finishing Cattle	0.36	0.044	0.087	0.13	0.18	0.22	0.26	0.31	0.35	0.39
Beef – Cow (confinement)	0.42	0.051	0.10	0.15	0.20	0.26	0.31	0.367	0.41	0.46
Beef - Growing Calf (confinement)	0.29	0.035	0.070	0.11	0.14	0.18	0.21	0.25	0.28	0.32
Dairy – Lactating cow – 100 lbs milk/day	1.04	0.13	0.25	0.38	0.51	0.63	0.76	0.88	1.0	1.1
Dairy – Lactating cow – 88 lbs milk/day	0.99	0.12	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.1
Dairy – Lactating cow – 70 lbs milk/day	0.83	0.10	0.20	0.30	0.40	0.50	0.60	0.71	0.81	0.91
Dairy – Lactating cow – 50 lbs milk/day	0.66	0.080	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72
Dairy – Dry cow	0.5	0.061	0.12	0.18	0.24	0.30	0.36	0.43	0.49	0.55
Dairy – Milk fed calves	0.017	0.0021	0.0041	0.0062	0.0083	0.010	0.012	0.014	0.017	0.019
Dairy - Calf	0.14	0.017	0.034	0.051	0.068	0.085	0.10	0.12	0.14	0.15
Dairy – Heifer	0.26	0.032	0.063	0.095	0.13	0.16	0.19	0.22	0.25	0.28
Dairy - Veal	0.033	0.0040	0.0080	0.012	0.016	0.020	0.024	0.028	0.032	0.036
Horse - Sedentary	0.2	0.024	0.049	0.073	0.097	0.12	0.15	0.17	0.19	0.22
Horse – Intense exercise	0.34	0.041	0.083	0.12	0.17	0.21	0.25	0.29	0.33	0.37
Poultry-Broiler	0.0025	0.00031	0.00061	0.00092	0.0012	0.0015	0.0018	0.0021	0.0024	0.0027
Poultry-Turkey (male)	0.0090	0.0011	0.0022	0.0033	0.0044	0.0055	0.0066	0.0077	0.0088	0.0099
Poultry-Turkey (females)	0.0054	0.00066	0.0013	0.0020	0.0026	0.0033	0.0040	0.0046	0.0053	0.0059
Poultry-Duck	0.0036	0.00044	0.00087	0.0013	0.0017	0.0022	0.0026	0.0031	0.0035	0.0039
Poultry - Layer	0.0035	0.00043	0.00085	0.0013	0.0017	0.0021	0.0026	0.0030	0.0034	0.0038
Swine-Nursery Pig(27.5 lb)	0.025	0.0031	0.0061	0.0092	0.012	0.015	0.018	0.021	0.025	0.028
Swine-Grow-finish (154 lb)	0.083	0.010	0.020	0.030	0.040	0.051	0.061	0.071	0.081	0.091
Swine – Gestating sow	0.071	0.0086	0.017	0.026	0.034	0.043	0.052	0.060	0.069	0.078
Swine – Lactating sow	0.19	0.023	0.046	0.069	0.092	0.12	0.14	0.16	0.18	0.21
Swine – Boar	0.061	0.0074	0.015	0.022	0.030	0.037	0.044	0.052	0.059	0.067

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